# THE IRON TRADE REVIEW

VOLUME XL. CLEVELAND, JANUARY 17, 1907 NUMBER 3

## STRONGER TONE

### CHARACTERIZES NEARLY ALL BRANCHES OF THE MARKET.

### Improved Demand for Structural Material—Bar Iron Firm in Most Places—Heavy Buying of Pig Iron at Chicago.

The market is considerably stronger than it was a week ago. Conditions which indicated the possible approach of weakness in some lines have disappeared to a large extent and there is renewed confidence in the continuance of the present prosperity. One of the notable developments of the week, showing the confidence of railroads in the continuance of prosperity, was the inquiry by steel car interests for plates for delivery extending into 1908. It is stated that inquiries for about 40,000 cars are now in the market, and deliveries on this large number could not be completed before July, 1908.

**Pig Iron Activity.** While buying of pig iron for the last half has been more active in Chicago than in other places, orders placed in nearly all centers were of fair volume and the sentiment in favor of buying was strong. An attempt of an important pipe interest to buy at prices below the ruling quotations resulted in only about one fifth of the desired tonnage being purchased, and the incident has confirmed the opinion that furnace interests will be able to resist any effort to batter down prices. Malleable and machinery manufacturing interests in the Chicago district have placed large orders for the last half, and it is expected that throughout the central west jobbing foundries will soon appear as liberal buyers. At Pittsburg the opinion prevails that there will not be heavy buying of steel making iron in the immediate future. Some steel makers are, however, finding that they have not covered fully for their immediate requirements and high prices are being paid for spot iron. Southern irons are strong and prices are tending to advance. Seven steamships carrying 30,000 tons of Middlesboro and Scotch iron for three American interests have been chartered for shipment to the Atlantic coast ports within the next two months. Owing, however, to the prosperity prevailing in England, and to the higher quotations being made there, it is doubtful whether foreign iron will furnish all the relief hoped for.

**Structural Material.** A decided improvement in the demand for structural material is noted, especially in the Chicago district, where the Illinois Steel Co. has received specifications for about 60,000 tons, of which some 50,000 tons came from a western car builder and included both plates and shapes. Numerous orders for bridge material aggregating a considerable tonnage have been placed and many inquiries for steel for new buildings in New York, Chicago and other cities are pending.

**Cast Iron Pipe Orders.** The cast iron pipe market, which has been rather quiet of late, is showing increased activity, and contracts for 14,000 tons have been closed within a few days, while the city of New Orleans is asking for bids on 38,000 tons. It seems probable that municipalities will find it necessary to abandon their waiting policy, as there is no prospect that they will be able to obtain lower prices. The bar iron market continues to show much irregularity. Although the leading interests are firmly maintaining prices, concessions are being made by Indiana mills, sales having been made on the basis as low as $31.50 Pittsburg.

## PRICES FOR 1906

### And for the Preceding Eleven Years as Shown in The Iron Trade Review Chart.

The chart which accompanies this issue as a supplement shows fluctuations in the price of iron and steel products during the months of 1906 and the eleven preceding years. The figures on which the chart is based are the average weekly prices given in the market reports of THE IRON TRADE REVIEW. They are computed for the following: Tank plates, Chicago; beams, Pittsburg; bar iron, Cleveland; Bessemer billets, Pittsburg; Bessemer pig iron, Pittsburg; No. 2 foundry, Chicago; gray forge, Cincinnati; No. 2 foundry, Birmingham.

The last-named product was not given in the charts of the preceding years, but is added for 1906 on account of the increasing importance of the southern market. It is interesting to note that southern pig iron shows a greater percentage of advance in price in the past twelve years than does any other product. The vertical lines in the chart represent months, and the horizontal lines the prices in dollars per net ton in the case of finished material, and per gross ton in the case of pig iron and steel billets. The solid and broken lines traversing the diagram indicate the changes in the monthly average prices, but do not, of course, show the extreme high or the extreme low prices that may have been reached in some week of the month. In the case of pig iron, the minimum quotations for prompt delivery are taken.

The chart shows the short-lived boom of 1895 which followed a period of depression; then the decline in the latter part of 1895, followed by the slow general decline of 1896 and 1897, when in midsummer the lowest prices on record prevailed; a rather steady trend of prices from the middle of 1897 until the fall of 1898; the rapid rise at the close of 1898 followed by the very high quotations of the boom year, 1899; a sharp decline in 1900, and a partial recovery at the close of

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# THE WEEK IN IRON CENTERS.

## PITTSBURG.

### Doubt as to a General Buying Movement in Pig Iron.—Contracts for Structural Material.

Office of THE IRON TRADE REVIEW. 521 PARK BUILDING, Jan. 16

There has been considerable talk during the past ten days of the beginning of a strong buying movement in pig iron, but when the volume of business to be done in second half is taken into consideration, and the tonnage of pig iron sold for this period figured up, there is but very little ground for the belief that the buying movement, if it can really be construed as such, is of any considerable proportion. It is true that considerable pig iron has been sold for delivery beginning in the second quarter and running through the year, but the total sales of Bessemer and basic since the first of the year will not aggregate over 38,000 to 40,000 tons. The sales have been small and scattered, the largest during the past week being 5,000 tons of Bessemer, the remaining running from 300 to 1,500 tons. The buyers in no instance have been the large steel making concerns. There is a well founded belief that the large consumers of steel making iron are not going to enter the market at this time to buy at the prices now ruling, but will wait until nearer the time they actually need the iron before buying, thus prevent any further advance and possibly succeed in securing their pig iron at much below the present quotations.

In finished lines the feature seems to be the enormously heavy specifications against existing contracts and with the exception of structural material, sheet and wire products and pipe, the actual new business has been light. The impression prevails that the large majority of the steel bar business has been closed for the year, but specifications against contracts already placed are in excess of the capacity of the mills. Bar iron is strong at 1.80c Pittsburg for delivery in this district and 1.60c base Pittsburg for shipment west from western mills and as far as conditions in this district are concerned, there is no ground for belief that prices are sagging. Semi-finished steel can be obtained more readily at this time than has been the case for several months.

**Pig Iron.**—The sales of basic and malleable iron during the past week for shipment beginning the second quarter are estimated at 10,000 tons at $22 valley furnace, 4,000 tons Bessemer at $22.25 valley furnaces. While there has been considerable second half movement since the first of the year, there is a decided difference of opinion as to whether or not a big second half buying movement has begun. With the exception of the purchase by the Wetsinghouse Air Brake Co., of between 15,000 and 20,000 tons of northern No. 2 foundry and gray forge iron, the former on basis of $21.50 furnace for the larger part, while $22.70 delivered Wilmerding with a 70c freight was paid on a small portion. On No. 2 southern $18.50 is quoted for second quarter, although some business has already been done on a basis of $18.25 Birmingham. A small tonnage of Bessemer iron for January shipment was sold at $23 valley furnace; another small tonnage, April to August delivery, at $22 and still another, January to May, at $22.50. Second half Bessemer is quoted $22 valley furnace and basic $21.50. On second quarter delivery we quote as follows:

| | |
|---|---|
| Bessemer Valley | 23.00 |
| Bessemer, Pittsburg | 23.85 |
| No. 1 Foundry, Pittsburg | 24.85 to 25.35 |
| No. 2 Foundry, Pittsburg | 24.35 to 24.60 |
| Gray Forge, Pittsburg | 22.85 to 23.35 |
| Basic, Valley | 22.50 |
| Basic, Pittsburg | 23.35 |

**Ferro-Manganese.** — Imported ferro-manganese 80 per cent for future deliveries is being offered in this market at $77 delivered Pittsburg. For spot shipment there is no change in prices and we quote $80 to $82.50. Improved ferro-silicon 50 per cent is quoted $108 to $110, 12 per cent, $36; 11 per cent, $35.

**Muck Bar.**—The pig metal making bar is quoted nominally at $37 Pittsburg and part scrap bar $34.

**Steel.**—The supply of semi-finished steel during the past two weeks has improved to a notable extent and the high prices quoted the past two weeks, to a large extent fictitious on account of the scarcity of material, are reduced. Bessemer steel billets are now quoted at $29.50 Pittsburg and open-hearth billets $32.00 to $33.00. Sheet bars, random lengths, are quoted $30.00 on contract. Since the first of the year, the new producers of steel have entered the market and this in a great measure accounts for the improvement in the supply.

**Skelp.**—Any skelp quotations made at this time are purely nominal, as there is practically no skelp, either iron or steel, to be had for anything like nearby delivery. Iron skelp is particularly scarce on account of the scarcity in muck bar. On light gage and narrow widths, with the usual differentials on heavier stock, we quote as follows:

Bessemer grooved, 1.70c to 1.75c; sheared, 1.70c to 1.75c; basic, grooved, 1.80c to 1.85c; sheared, 1.75c to 1.85c; iron skelp, sheared, 2.15c to 2.25c; grooved, 2c to 2.10c.

**Plates.**—One of the most interesting features in the whole iron and steel business during the week under review came out when the steel car interests began to make inquiries for plates extending into 1908, and the information given out is that inquiries in the neighborhood of 40,000 cars are now in the market, showing that the railroad companies have confidence in the future for practically a year and a half at least, as deliveries on this number of cars could not be made much before July, 1908, when the work now on hand in this line is taken into consideration. The plate market is exceedingly strong, with local makers quoting 1.70c base Pittsburg, or 1.84½c delivered in the east. Eastern mills are quoting 1.80c their mill. The increased demand for structural material has made a still further call for plate and considerable oil tank business is now under consideration. We quote:

Tank plate ¼-inch thick, 6¼ to 100 inches, 1.70c f. o. b. mill Pittsburg. Light plate schedule, No. 10, 1.80c; Nos. 11-12, 1.85c; Nos. 13-14, 1.90c; Nos. 15-16, 2c. Extras on the regular plate schedule are as follows per 100 pounds: Boiler and flange steel plates 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than four inches in width at ends, narrowest end not being less than 30 inches, 0.10c; complete circles, 0.20c. Plates in width over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1.00c. Gages under ¼-inch to and including 3-16-inch plates on thin edges, 0.10c; under 3-16 inch to and including No. 8, 0.15c; under No. 8 and including No. 9, 0.25c. Five cents extra for less

than carloads. Terms, net cash in 30 days.

**Sheets.**—The anticipated advance in the price of galvanized sheets has not been announced, but with a further advance in the price of spelter, it may be expected any time. The new business continues in fair volume and specifications are unusually heavy for this time of the year. Some of the independent mills in position to give delivery within a month or six weeks, are quoting an advance of $1.00 over the official prices. The average deliveries by the leading interest is 14 to 16 weeks. We quote:

Black steel sheets, one pass, cold rolled: Nos. 11-12, 2.20c; Nos. 13-14, 2.25c; Nos. 15-16, 2.30c; Nos. 17-21, 2.35c; Nos. 22-24, 2.40c; Nos. 25-26, 2.45c; No. 27, 2.50c; No. 28, 2.60c; No. 29, 2.75c; No. 30, 2.85c; galvanized, Nos 10-11, 2.55c; Nos. 12-14, 2.65c; Nos. 15-16, 2.75c; Nos. 17-21, 2.90c; Nos. 22-24, 3.05c; Nos. 25-26, 3.25c; No. 27, 3.45c; No. 28, 3.65c; No. 29, 3.90c; No. 30, 4.15c. Corrugated roofing, $1.85 per square for No. 28 painted, 2½-inch corrugation and $3.15 per square No. 28 galvanized, 2½ inch corrugation. Blue annealed sheets, No. 10 and heavier, 1.80c; Nos. 11-12, 1.85c; Nos. 13-14, 1.90c; Nos. 15-16, 2c.

**Tin Plate.**—There is a steady run of specifications against existing contracts, but the aggregate is not at all heavy, although sufficient to keep the mills in operation and prevent accumulation of stock such as the tin plate interests would like to accumulate against heavy business in the early spring months. There has been no advance in price and no immediate advance is expected. Under the sliding wage scale agreement based on the monthly shipments, the members of the Amalgamated association secured an advance equal to 2½ per cent on the showing made during December. We quote as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.90 f. o. b. mill, Pittsburg district. Terms, 30 days, less two per cent for cash in 10 days.

**Hoops and Bands.**—From a mill standpoint, hoops and bands are in a better shape for delivery than any other branch of finished material. There is no new business to speak of and specifications are running about even with the output of the mills. We quote:

Hoops, in carload lots, 2c; in less than carload lots, 2.10c; bands, 1.60c base, half extras as per standard steel card. Prices f. o. b. Pittsburg.

**Rails and Track Material.**—The actual new business taken on by local mills during the past week, both light and standard sections, was not in excess of 10,000 tons, although the inquiry was very heavy and aggregated about 150,000 tons. There has been no change in prices and local mills are paying no attention to the advance of $2.00 per ton made by eastern mills, although they still have some capacity for delivery prior to July 1. We quote as follows:

50 pound and heavier, 500-ton lots and over, $28.00; carload and less than 500 pound, $30; less than carload lots, $32; 8 pound, $40; 12 pound, $36 to $37; 16 pound, $35 to $36; 20 pound, $34 to $35; 25 to 45 pound, $33 to $34; angle splice bars for standard sections, $1.65; spikes, for forward delivery, $2.50 to $2.75.

**Merchant Bars.**—There is still some buying of steel bars, but it is not in large tonnages, and the opinion is prevalent that the majority of buyers have covered for their requirements practically through the year. The 1.60c base price is very firmly maintained and there is apparently little premium business being taken. The iron bar market is not weak and in this district at least there has not been any decided sag as has been reported from some quarters. The minimum price is 1.80c base Pittsburg for delivery in this district and 1.60c base, Pittsburg, plus freight to point of shipment on western business. The situation in the west is stronger than it was a week ago, and one of the largest buyers of bar iron in the central west during the past week took 3,700 tons at 1.65c base Pittsburg for delivery at points west from western mills, plus freight to delivery points in the west. Another central western buyer took 7,000 tons at a trifle over 1.60c base Pittsburg. The mills are filled from three to four months on bar iron. Specifications against steel bar contracts are enormously heavy and in most instances are in excess of mill capacity. We quote as follows:

Common iron bars, 1.80c Pittsburg in carload lots and over; 1.85c in less than carloads; Bessemer steel bars, 1.60c, plow and cultivator, 1.60c, net; channels, angles, zees, tees, under three inches, 1.70c, all f. o. b. Pittsburg. The following differentials are maintained on steel: advance. Cold rolled and ground shafting, 50 per cent off in carload lots, and 5 per cent off in less than carloads, delivered in base territory; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flats, 1.60c to 1.65c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.10c to 2.15c. The price of planished and machine straightened tire is 1.80c, base, half tire extras. Iron finished tire up to 1½ inch and over to be sold on regular bar basis of 1.60c base, half extras, steel card.

**Structural Material** — Construction companies are now looking for business and during the past week several very nice contracts have been closed by local concerns. Among them new building for the Niagara Gypsum Co., Niagara Falls; 1,200 tons railway bridge work for the Louisville & Nashville Ry.; two buildings for the Vandergrift plant of the United Engineering & Foundry Co., and one building for the Youngstown plant of the same concern; 1,000 tons of bridge work for the Great Northern Ry., and 8,000 tons of railway work is now under negotiation. Construction companies are in position to give reasonably quick delivery on all classes of work. From the mill point of view, the structural situation has improved materially and upwards of 200,000 tons has been placed since the first of the year. There is still plenty of mill capacity, however, and good deliveries can be made on the full range of rollings. We quote as follows:

Beams and channels, 15-inch, and under, 1.70c; over 15 in., 1.80c; zees, 1.70c; tees, 1.70c; angles from three to six inches inclusive 1.70c; over six inches, 1.80c; universal and sheared plates, 6¼ inches and wider, 1.60c base.

**Wire and Wire Nails.**—Buyers are still pressing for deliveries and specifications are very heavy. Prices are unchanged.

**Merchant Pipe.**—The demand for merchant pipe continues as great as ever and specifications against contracts are very heavy, the average delivery now have three months on the standard sizes. Prices are very firm, jobbers' discount being 77 base sizes and 5. Consumers' carloads best discounts are as follows:

| | Steel black | Steel galv. |
|---|---|---|
| ⅛ to ¼ inch | 67 | 51 |
| ⅜ inch | 69 | 55 |
| ½ inch | 71 | 59 |
| ¾ to 6 inches | 75 | 65 |
| 7 to 12 inches | 70 | 55 |
| EXTRA STRONG PLAIN ENDS. | | |
| ⅛ to ⅜ inch | 60 | 48 |
| ½ to 4 inches | 67 | 55 |
| 4½ to 8 inches | 63 | 51 |
| Double extra strong plain ends, ½ to 8 inches | 56 | 45 |

**Wrought Iron Pipe.**—The wrought iron pipe market is on the advance and the official discount is 70 off, while 71 off has been granted in exteme cases, and an instance is noted where a producer bought wrought pipe at 72 and 5. We quote official discounts as follows:

| | Card Weight black | galv |
|---|---|---|
| ⅛, ¼ and ⅜ inch | 62 | 46 |
| ½ inch | 65 | 54 |
| ¾ to 4 inch | 70 | 60 |
| PLUGGED AND REAMED. | | |
| 1 to 4 inch | 63 | 58 |
| EXTRA STRONG PLAIN ENDS. | | |
| ⅛, ¼ and ⅜ inch | 55 | 43 |
| ½ to 4 inch | 62 | 50 |
| DOUBLE EXTRA STRONG. | | |
| ½ to 4 inch | 51 | 40 |

**Boiler Tubes.**—New business is being taken in fair volume and specifications against contracts are very heavy. No change in prices has been announced this week and we quote as follows:

| Boiler tubes. | Steel | Iron |
|---|---|---|
| 1 to 1½ inches | 48 | 48 |
| 1¾ to 2¼ inches | 60 | 48 |
| 2½ inches | 62 | 48 |
| 2¾ to 5 inches | 68 | 55 |
| 26 to 13 inches | 60 | 43 |

Less than carloads two points less.
2½ inches and smaller, over 18 feet, 10 per cent, net, extra.
2¾ inches and larger, over 22 feet, 10 per cent, net extra.

**Coke.**—The market on foundry coke has not been as strong during the week under review as it had been for a month or six weeks past, and for prompt shipment we quote $3.90 to $4.15, depending on the brand, and for the first half of the year $3.75 to $4 is quoted, this spread also on the brands, while $3.75 is quoted on contract for the remainder of the year. This sag in prices from last week is probably due to the stocked up condition of many of the foundries, which before the first of the year anticipated their requirements to a large extent, expecting cold weather and car shortage, while the contrary has been the fact. The car supply in the region is very much improved, especially as far as box cars are concerned. Railroads are not having any considerable trouble in moving the tonnage. Furnace coke, for which there is a good demand for spot shipment, is quoted $3.75 to $3.85 for spot shipment and $3.40 to $3.50 on contract from now until July 1. Furnace coke for the year is quoted $3.10 to $3.15.

**Old Material.**—There has been a general reduction in prices of scrap during the past week and on account of the buying embargoes have been placed on the plants of several of the large consumers, the open winter having permitted the mills to accumulate stocks and material came in so freely that they are unable to handle more. It is reported without confirmation, however, that the Carnegie Steel Co., bought a round tonnage of heavy melting stock at a figure considerably below current quotations. Dealers who accumulated heavy stocks while speculating on the rising market are now endeavoring to dispose of their holdings and this accounts, to a great extent, for the general decline in prices. We quote as follows:

Heavy melting scrap, $18.50 to $19; re-rolling rails, $21 to $21.50; bundled sheet scrap, $16 to $16.50; iron axles, $30.50 to $31; old iron rail, $26 to $26.50; No. 1 wrought scrap, $20 to $20.50; old car wheels, $23.50 to $24; low phosphorus scrap, $22 to $22.50; machine shop turnings, $14.75 to $15.25; axle turnings, $15 to $15.50; cast borings, $12.25 to $12.50; No. 1 cast scrap, $20 to $20.50.

## CHICAGO.

### Increased Demand for Structurals.—Plates Active.—Pig Iron Strong.

Office of THE IRON TRADE REVIEW,
1362 MONADNOCK BLOCK, Jan. 16.

The volume of business in both shapes and fabricated steel has increased liberally in the past week. The Pennsylvania Steel Co. closed for 6,000 tons of bridge material with the C. M. & St. P. railway, the American Bridge Co. has taken 6,500 tons for San Francisco buildings, and 4,000 tons for the C. & N. W. railway, while the Illinois Steel Co. has received specifications for upwards of 60,000 tons. Of this latter, 50,000 tons was from a western car builder, and included plates as well as shapes, shipments to commence in May. The demand for plates is extremely active. On universal sizes, the Steel Corporation is sold up for the year, while on sheared plates the best delivery that can be given by the local mill is three months. Two contracts for cast iron pipe, aggregating 14,000 tons, were closed this week, and makers have been asked to figure on the requirements of the City of New Orleans, amounting to 38,000 tons, for deliveries running through the years 1907 and 1908. This contract will be let in six sections, bids to be opened Jan. 23.

Pig iron continues unusually strong and active, prices having advanced for second and third quarter deliveries. An Ohio pipe manufacturer made an offer of 27,000 tons to northern and southern producers for last half delivery at prices a little below prevailing schedules, but succeeded in obtaining less than 5,000 tons on the basis offered. The Allis-Chalmers Co., has placed its order for the last half, dividing about 10,000 tons between northern and southern furnaces. The leading malleable interest also bought 25,000 tons for the same delivery.

Construction of two new blast furnaces has been commenced at South Chicago. One is for the International Harvester Co., and the other for the Federal Furnace Co. The new stack of the latter company just completed will be blown in next week. The entire output of the first year's operation of this furnace was long ago sold, and the increased capacity will not avail the present congestion.

The scarcity of crude steel in this market continues a depressing feature. Outside offerings are free, but few orders can be placed with local mills. Several of the open-hearth furnaces of the Illinois Steel Co. are idle for repairs, and finishing capacity is correspondingly curtailed. Shipments of steel bars from the Milwaukee mill have been especially affected by this condition.

**Pig Iron.**—Among the buyers this week, was a large malleable interest which took upwards of 25,000 tons of malleable Bessemer for the last half, a Milwaukee machinery manufacturer which bought around 10,000 tons and a host of other melters who have bought lots ranging downwards from 5,000 tons. The movement for the last half is on a large and active scale and furnaces are rapidly filling up for that period. Some local stocks now decline to quote for the third quarter only, but insist that fourth quarter requirements be included. The remarkable strength of the market for the last half is illustrated by the experience of an Ohio pipe producer who put out an inquiry for 27,000 tons for that shipment at an upset price slightly below prevailing quotations. Although all the leading northern and southern interests received the offer, the company was able to pick up less than 5,000 tons on the basis suggested. It closed for this tonnage and withdrew from the market on the remainder. In the week past, there has been another readjustment of northern and southern values, resulting in advances for some deliveries. Eight separate schedules are now in force. One is for spot shipment; another for March delivery; a third for second quarter; one for the first half; one for the third quarter; another for fourth quarter; one for the last half; and one for the entire year's requirements.

Spot iron is without change in price, No. 2 southern being offered at $23 Birmingham, and northern No. 2 at $27 Chicago. For second quarter, southern irons have advanced to the basis of $22 Birmingham; northern No. 2 for the same delivery is held at $25 to $25.50 Chicago. For the last half, local irons are held at $22 to $23.50 Chicago, while southern grades for the same shipment are quoted at $19 to $19.50 Birmingham for No. 2 foundry. The main feature of the

week's trading is the active buying by malleable foundries for the last half, and the supplementary orders from the rank and file of the trade for the second quarter. Both are in large volume and presage a melt unparalleled in recent years. We have revised our prices, the maximum quotations below being for second quarter and the minimum for the third quarter deliveries.

| | |
|---|---|
| Lake Superior charcoal | $24.50 to 26.50 |
| Northern Foundry No. 1 | 24.00 to 26.00 |
| Northern Foundry No. 2 | 23.50 to 25.50 |
| Northern Foundry No. 3 | 23.00 to 25.00 |
| Northern Scotch Foundry | 24.00 to 26.00 |
| Ohio Strong Softeners No. 1 | 25.30 to 26.30 |
| Ohio Strong Softeners No. 2 | 24.80 to 25.80 |
| Southern Foundry No. 1 | 23.85 to 26.85 |
| Southern Foundry No. 2 | 23.35 to 26.35 |
| Southern Foundry No. 3 | 22.85 to 25.85 |
| Southern Foundry No. 4 | 22.35 to 25.35 |
| Southern No. 1 Soft | 23.85 to 26.85 |
| Southern No. 2 Soft | 23.35 to 26.35 |
| Southern Gray Forge | 21.85 to 23.35 |
| Southern Mottled | 21.35 to 22.85 |
| Southern Silveries 4 per cent to 6 per cent Silicon | 26.35 to 28.35 |
| Jackson Co. Silveries, 8 to 10 per cent Silicon | 32.30 to 33.30 |
| Malleable Bessemer | 23.50 to 25.50 |

**Billets and Rods.**—A Cleveland broker tried without success, this week to place an order for 6,000 tons of wire billets with local mills. All the western plants are tightly sold ahead and none is in position to handle any such lots of this character. The extra tonnage being rolled occasionally by the Illinois Steel Co. on its structural mill is absorbed by the increased demands of its Milwaukee plant and no portion of this will be placed on the market. Prices are firm at $38 minimum for forging billets, and $41 Chicago for wire rods.

**Iron and Steel Bars.**—No change is observed in bar iron. For ordinary lots, the market is firm at 1.65c Pittsburg, but on desirable business this price can be shaded from 50 cents to $1 a ton. On the other hand, premiums are obtained of 50 cents to $1 a ton for prompt shipment. Good buying is in progress and specifications are of fair proportions. New tonnage in steel bars is also of good volume. Shipments from the Milwaukee plant of the Illinois Steel Co. are slow because of the scarcity of billets there. This shortage has been acutely felt for some weeks, but is gradually being improved by the increased supply as a result of the transfer of the structural mill at South Chicago on billets. The car shortage continues a harrassing factor, little, if any, improvement being shown. We quote as follows:

Soft steel bars and bands, 1.76½c, half extras; soft steel angles, less than 3 x 3, 1.86½c; hoops, 2.16½c base, full extras; old rail stock, 1.70c. We quote bar iron from stock, 2.25c; full extras, soft steel rounds and squares, 3 inches and larger, $2 per 100 pounds base; flats, 2 inches to 4 inches by 1⅛ inch and larger, $2 per 100 pounds base; 4½ inches x 5 inches and 6 inches x 5-16 inch and thicker, $2 per 100 pounds base; all ovals, half rounds, $2 per 100 pounds base; steel bands, $2.00, half extras; soft steel hoops, 2.40c to 2.50c full extras. Other sizes not mentioned above, $2 per 100 pounds base plus half extras.

**Sheets.**—Specifications and new tonnage for sheets are heavy. The best delivery obtainable from local mills is ten to twelve weeks on galvanized, and eight to ten weeks on black. Prices are firm, and for quick shipment no difficulty is experienced in securing premiums of $1 a ton. We quote carload lots as follows:

Black sheets, Nos. 8, 9 and 10, 1.85c Pittsburg; No. 28 gage, 2.60c Pittsburg. Galvanized sheets No. 28 gage 3.65c Pittsburg. Freight to Chicago 16½c per 100 pounds. Jobbers' prices on less than carload lots from store are as follows: Black sheets, No. 10, 2.20c to 2.30c; No. 12, 2.25c to 2.35c; No. 14, 2.30c to 2.40c; No. 16, 2.40c to 2.50c; Nos. 18-20, 2.70c to 2.80c; Nos. 22-24, 2.75c to 2.85c; No. 26, 2.80c to 2.90c; No. 27 2.85c to 2.95c; No. 28, 2.95c to 3.05c; No. 30, 3.35c. Galvanized sheets, Nos. 10 to 20, 3.30 to 3.35c; Nos. 22 and 24, 3.45c to 3.50; No. 26, 3.65c to 3.70c; No. 27, 3.85c to 3.90c; No. 28, 4.05c to 4.10c; No. 30, 5.25c to 5.30c.

**Plates.**—Consumers in all lines of trade are specifying heavily against existing contracts. Mills are overwhelmed with orders, and on sheared plates cannot give delivery inside of three months. Universal sizes are still harder to obtain, the Carnegie Steel Co. being sold upon this material for the balance of the year. Eastern independent mills in position to make shipments of universal plates are asking on the basis of 2c to 2.10c Pittsburg for same. Demand from car builders and railroads is especially heavy, one specification from these interests received this week being for 50,000 tons of plates and shapes. Prices are very firm, as follows:

Tank steel, ¼-inch and heavier, up to 100 inches wide, 1.60c to 1.90c Pittsburg base. For extras see Pittsburg report. Freight rate to Chicago is 16½c per hundred pounds.

Jobbers' prices for shipment from local stocks are as follows. Tank steel ¼ inch and heavier, up to 72 inches wide, 2.10c; 72 inches up to 96 inches wide, 2.20c; 3-10 inch up to and including 60 inches wide, 2.20c; 3-16 inch, 72 inches wide, 2.45c; No. 8, up to 60 inches wide, 2.25c; flange steel, 25c extra; heads, 25c extra.

**Structural Steel.**—The week's specifications have given the outlook a more sanguine appearance. One car builder sent in mixed specifications for structural shapes and plates, aggregating 50,000 tons, shipments to commence in May. From other sources, shipping instructions have been received for over 10,000 tons, delivery to commence at once. A tremendous amount of new building is under negotiation, and if only half of it is closed, local fabricators report that their shops will be filled with work for the balance of the year. The Chicago Milwaukee & St. Paul railway has closed with the Pennsylvania Steel Co. for the 6,000 tons of bridge material that have been pending for some weeks. The American Bridge Co. has also closed contracts for the following San Francisco structures: Straus building, 850 tons; Phelan building, 3,500 tons; Grant building, 1,000 tons; Walsh building, 500 tons, and the Berkeley National bank, 500 tons. We quote as follows:

Beams and channels, 3 to 15 inches inclusive, 1.70c Pittsburg. For extras see Pittsburg report. Freight rate from that city to Chicago is 16½c per 100 pounds. Quotations from store are as follows:

All angles, three inches and larger, including six inches, $2.05 to $2.10 per 100 pounds; angles over six inches, $2.15 per 100 pounds base; beams, three inches to 15 inches, inclusive $2.05 to $2.10 per 100 pounds base; channels, three inches and larger, $2.05 per 100 pounds base. Less than carload lots are $2 a ton higher than foregoing prices.

**Rails and Track Supplies.**—No rail tonnage of importance has been closed in the week under review. Light rails are in good demand, specifications being in excess of output. Spikes and bolts are also moving freely, though better deliveries can be given on the latter than on the former. We quote as follows:

Bessemer rails, $28 to $30; less than 500-ton lots, $32; open-hearth rails, $29; light rails, Bessemer, 30 to 45-pound sections, $33; 25-pound, $34; 20-pound, $35; 16-pound, $36; 12-pound, $37, and lighter sections down to 8-pound, $43.50, all f. o. b. mill. Track supplies vary in price according to quantity and delivery. Angle bars in large lots are quoted 1.65c to 1.75c; for smaller quantities, 2.25c to 2.75c; spikes, large lots, 2.25c; for smaller quantities, 2.50c; bolts, large lots, 2.65c to 2.75c; smaller lots, 2.85c with square nuts, and 3c with hexagon nuts.

**Merchant Steel.**—No change is apparent in the local situation from that reported previously. Specifications continue very heavy, and shipments are slow. We quote carload lots, Chicago delivery, as follows:

Planished or smooth finished tire steel, 1.96½c; iron finish, up to 1½ x ¼ inch, 1.91½c; base iron finish 1½ x ½ inch and larger, 1.76½c, base; channels for solid rubber tires, ¾ to 1 inch, 2.26½c, and 1⅛ inch and larger, 2.16½c; smooth finished machinery steel, 2.01½c; flat sleigh shoe, 1.81½c; concave and convex sleigh shoe, 2.06½c; cutter shoe, 2.35c; toe calk steel, 2.31½c; railway spring, 1.96½c; crucible tool steel, 6½c to 8c, and still higher prices are asked on special grades. Shafting is very strong and an advance is expected. Quotations are without change at 50 per cent off in car lots and 45 per cent in less than car lots, in base territory.

**Cast Iron Pipe.**—Contracts were closed this week for 12,000 tons for the People's Gas Light & Coke Co., Chicago, which was placed with the Massillon Iron & Steel Co., for 2,000 tons of pipe for Minneapolis which was awarded to the United States Cast Iron Pipe & Foundry Co. The City of New Orleans, which is reconstructing its water works system, has invited bids on 38,000 tons of pipe of various sizes, for deliveries extending over 1907 and 1908. This contract will be let in six sections, and bids will be opened Jan. 23. Prices are very firm as a result of the increasing cost of pig iron, but are without change, as follows: Four-inch water pipe, $37; 6, 8, 10 and 12-inch, $36; gas pipe, $1 a ton higher.

**Merchant Pipe.**—Jobbers and consumers are specifying freely for forward wants. Mills are not shipping very promptly, however, owing to the car shortage and congestion of orders. Prices are firmly maintained on the following basis: ¾ to six-inch black steel pipe, 75.35 per cent discount; galvanized, 65.35 per cent discount. From store in small lots, Chicago distributors are asking 72 to 73 per cent discount on the base sizes.

**Boiler Tubes.**—Demand continues very brisk, stocks in jobbers' warehouses having become greatly depleted by the slow shipments from mills. We quote official discounts, Chicago delivery, as follows: 2¾ to five inches, steel, 66.35; iron, 55.35; seamless, 50.35; 2½ inches and smaller, and lengths of over 18 feet, and 2½ inches and larger, and lengths over 22 feet, 10 per cent extra. On less than carload lots from store, we quote 60 off for steel; 47½ for iron, and 42½ for seamless.

**Wire Products.**—In the two weeks that have elapsed since the first of the month, no indications of decline in demand are noticed. The movement is especially brisk in nails, smooth wire and poultry netting, the leading interest not being able to accumulate any stocks of these materials. Serious delay is occasioned to shipments by the shortage of cars, heightened in the last few days by a scarcity of raw material. Prices are very firm on the following basis, these being jobbers' quotations for Chicago delivery:

Wire nails, $2.15; painted barbed wire, $2.30; galvanized barbed wire, $2.60; smooth annealed wire, $2.30; polished staples, $2.30; galvanized staples, $2.55. Carload lots to retailers, five cents higher; less than carload lots, 15 cents higher.

**Coke.**—Local consumers are not contracting very heavily for forward requirements, bending their efforts instead toward getting shipment of the cars due. Deliveries from all coke producing points are slow, and for spot shipment premiums of 25 cents and 50 cents a ton are offered. We quote Connellsville, 72-hour brands, $4.25 to $4.50 ovens. Local by-product coke is firm at $6.65 to $7.15.

**Old Material.**—Demand for car wheels is very brisk, and all that is offered can be placed at $25 Chicago. The market continues soft, the open weather, the large offerings by railroads and the light buying of consumers all aiding in the downward progress. The Northern Pacific, Illinois Central, Santa Fe and Baltimore & Ohio have new lists out aggregating 10,000 tons. Old iron rails have declined to $27, though one sale is reported to have been made in the neighborhood of $25. No. 1 railroad wrought has sold as low as $16 Chicago. We have revised our prices and quote as follows, gross tons being given in the first paragraph:

| | |
|---|---|
| Old Steel Rails (4 feet and over) | $19.50 to 20.50 |
| Old Steel Rails (less than 4 feet) | 19.00 to 19.50 |
| Old Car Wheels | 24.75 to 25.00 |
| Old Iron Rails | 26.50 to 27.00 |
| Relaying Rails, subject to inspection | 29.00 to 30.00 |
| Frogs, Switches and Guards | 17.50 to 18.00 |
| Heavy Melting Steel | 17.00 to 17.50 |
| Mixed Country Steel | 14.50 to 15.00 |

**We quote net tons, as follows:**

| | |
|---|---|
| No. 1 R. R. Wrought | $16.25 to 16.75 |
| No. 2 R. R. Wrought | 15.25 to 15.75 |
| Shaft [illegible] | 18.00 to 18.50 |
| Dealers' Forge No. 1 | 12.50 to 13.00 |
| Wrought Pipe and Flues | 12.00 to 12.50 |
| No. 1 Cast, 150 pounds and less | 18.00 to 18.50 |
| No. 1 Mill | 10.50 to 11.00 |
| Mixed Busheling (No. 1 & No. 2) | 11.50 to 12.00 |
| Country Sheet | 9.00 to 9.50 |
| No. 1 Boilers Cut | 12.50 to 13.00 |
| Boiler Punchings | 16.00 to 16.50 |
| Iron Car Axles | 27.00 to 27.50 |
| Steel Car Axles | 22.00 to 22.50 |
| Iron Axle Turnings | 11.50 to 12.00 |
| Cast Borings | 8.75 to 9.00 |
| Mixed Borings, etc | 8.75 to 9.00 |
| Machine Shop Turnings | 11.00 to 11.50 |
| Railroad Malleable | 17.50 to 18.00 |
| Agricultural Malleable | 16.00 to 16.50 |
| Stove Plate and Light Cast Scrap | 14.50 to 15.00 |
| Old Iron Splice Bars | 22.00 to 22.50 |

G. H. Jones, of the Inland Steel Co., Chicago, is home from England.

## CLEVELAND.

### Pig Iron is Firm, with Considerable Buying.—Bar Iron Ragged.—Scrap Weak.

Office of THE IRON TRADE REVIEW, Browning Building, Jan. 15.

**Iron Ore.**—Considerable activity is already being shown in arranging for the forwarding of ore from docks and it is expected that the movement will be rapid during the next few weeks unless the weather should become extremely cold, and that the amount left on dock on May 1 will be as low as it has been at that time in any recent year. Some furnaces are showing anxiety concerning their ore supplies, and eastern furnace interests are depending largely upon foreign ore to fill out their requirements. We quote as follows: Old Range Bessemer, $5.00; Mesabi Bessemer, $4.75; Old Range non-Bessemer, $4.20; Mesabi non-Bessemer, $4.00.

**Pig Iron.**—The market is strong and considerable tonnage is being sold for the last half of the year.

An important pipe interest noted as a very close buyer inquired for a large tonnage, but was able to buy only about one-fifth of the amount desired at the price it was willing to pay and withdrew, impressed by the strength of the market.

Buying has been largely by steel plants and malleable interests, but jobbing foundries are showing a disposition to contract and there seems to be no probability that prices will be lower. Foundries which have recently made new contracts with buyers of castings report that they have had little difficulty in obtaining higher prices. One important furnace interest sold a considerable tonnage a few days ago, then advanced its quotation for the last half from $21.50 to $22.50 for No. 2 and has since made some sales at the new price. Other interests have, however, been selling at $22. Some steel interests are finding that they need additional supplies of basic, and as high as $23.00 for spot basic has been paid. One valley furnace running on basic is about to be blown out for relining. English foundry iron is being sold at about $25.50 delivered in Cleveland. For second quarter we quote f. o. b. Cleveland as follows:

| | |
|---|---|
| Bessemer | $22.35 to 23.35 |
| No. 1 Foundry | 23.50 to 24.50 |
| No. 2 Foundry | 23.00 to 24.00 |
| No. 3 Foundry | 22.50 to 23.50 |
| No. 2 Southern | 23.35 to 23.85 |
| Gray Forge | 21.00 to 22.00 |
| Lake Superior charcoal | 26.00 to 27.00 |

**Coke.**—The mild weather has been favorable for the delivery of coke, and little difficulty is experienced in get-

ting cars. Foundry coke is selling at $4.15 to $4.25, and furnace coke at $3.65 to $3.85, ovens.

**Finished Materials.**—The independent interests which recently advanced the price of standard Bessemer sections to $30 are selling in small quantities. The bar iron market is very irregular. Although the principal producer adheres to 1.80c Pittsburg and local mills are selling at 1.80c Cleveland, Indiana mills are quoting as low as 1.57½c Pittsburg. Local mills, while well supplied with orders, are able to take care of limited tonnages at the prevailing quotation. The sheet market is active and the principal producer is now about 16 weeks behind on its deliveries. The inability to deliver in shorter time is due in part to the difficulty of the mills in obtaining a sufficient supply of sheet bars. The shafting market is very irregular. The demand for boiler tubes has improved. On the whole, the demand for finished materials is not so active, but there are no indications of weakness, except possibly in bar iron.

**Old Materials.** — The market is weaker and in the lull following the holidays, prices have generally fallen off. However, many orders have already been placed and dealers are not worrying at the sagging which as a rule is on odd lots. The market situation is favorable for the shorts. Some conservative interests look for a recovery in a month. We quote Cleveland delivery, gross tons in the first paragraph, as follows:

| | |
|---|---|
| Old iron rails | $26.00 to 27.00 |
| Old steel rails (over 6 feet) | 19.50 to 20.00 |
| Old steel rails (under 6 feet) | 19.00 to 20.00 |
| Old car wheels | 21.00 to 21.50 |
| Steel boiler plate | 15.50 to 16.00 |
| Steel axles | 21.00 to 22.00 |
| Malleable iron (railroad) | 19.50 to 20.00 |
| Malleable iron (agricultural) | 15.50 to 16.00 |
| Heavy steel | 17.00 to 17.50 |
| Country mixed steel | 15.00 to 15.50 |
| Low phosphorus | 23.00 to 24.00 |

**We quote net tons as follows:**

| | |
|---|---|
| No. 1 R. R. wrought | $18.00 to 18.50 |
| No. 1 busheling | 15.00 to 15.50 |
| No. 1 machine cast | 18.00 to 18.50 |
| Iron axles | 25.50 to 26.00 |
| Axle turnings | 13.50 to 14.00 |
| Wrought turnings (free from cast) | 12.00 to 12.50 |
| Grate bars | 14.00 to 14.50 |
| Pipes and flues | 14.50 to 15.00 |
| Tank iron | 12.00 to 12.50 |
| Hoop and band iron | 8.50 to 9.00 |
| Sheet iron | 8.50 to 9.00 |
| Wrought drillings | 12.00 to 12.50 |
| Stove plate | 14.00 to 14.50 |
| Cast borings | 9.00 to 9.50 |

## CINCINNATI.

### Increased Activity in Last Half Iron With Prices on Same Level.

January 15.

**Pig Iron.**—Interest seems to center in iron for the last half of the year. There is more inquiry and increased trading in that delivery. Large and small melters are alike seeking information which will help them in deciding whether to cover now or wait. Sales agencies are appealed to for advice, and in turn sales agencies are asking consumers for market views. The result of this interchange of information is decidely in favor of buying, as there appears to be nothing in sight to disturb the trend of prices. The past week has witnessed no new developments in the situation of importance, but the demand has kept up and furnace views are strong at quotations now prevailing.

Spot southern iron is now the same as first quarter and is quoted at $23.00 to $24.00 Birmingham. Second quarter is quoted at $21.00 to $22.00 Birmingham. These quotations apply to the higher grades as the low grades are easy and for anything below No. 2, there is a difference of one dollar per ton being made between the grades instead of the usual fifty cents. Spot iron is herewith quoted, delivered Cincinnati, as a basis for settling contracts based on our quotations.

| | |
|---|---|
| Southern foundry No. 1, | $26.50 to 27.50 |
| Southern foundry No. 2, | 26.00 to 27.00 |
| Southern foundry No. 3, | 25.00 to 25.50 |
| Southern foundry No. 4, | 24.00 to 24.50 |
| Southern fdry. No. 1 soft, | 26.50 to 27.50 |
| Southern fdry. No. 2 soft, | 26.00 to 27.00 |
| Gray forge | 23.00 to 23.50 |
| Northern foundry No. 1, | 26.65 to 27.75 |
| Northern foundry No. 2, | 26.15 to 27.15 |
| Northern foundry No. 3, | 25.65 to 26.65 |
| Jackson County silvery, 8 per cent | 31.15 |

Southern iron for last half delivery is mainly quoted at $18.50 to $19.00 Birmingham for No. 2 with the usual differences between the grades. Northern iron in southern Ohio for the last half is quoted at $21.50 to $22.00 at furnace. The inquiry is almost confined to the higher grades and furnaces are using efforts to induce taking of the lower grades so that consumers who can use the lower grades have an advantage in placing contracts. Deliveries have shown some improvement but are far from satisfactory. We quote for second quarter delivery delivered Cincinnati as follows:

| | |
|---|---|
| Southern Foundry No. 1 | $24.50 to 25.50 |
| Southern Foundry No. 2 | 24.00 to 25.00 |
| Southern Foundry No. 3 | 23.00 to 24.00 |
| Southern Foundry No. 4 | 22.00 to 23.00 |
| Southern Foundry No. 1, soft | 24.50 to 25.50 |
| Southern Foundry No. 2, soft | 24.00 to 25.50 |
| Gray Forge | 21.00 to 22.00 |
| Northern Foundry No. 1 | 24.65 to 25.15 |
| Northern Foundry No. 2 | 24.15 to 24.65 |
| Northern Foundry No. 3 | 23.65 to 24.15 |
| Jackson County Silvery, 8 per cent | 28.15 to 29.15 |

**Coke.**—The market is not so active as delivery on contracts is now the order of the day. It is reported that there is continued improvement in the movement from the ovens. Prices remain firm at the following quotations in the leading coke producing districts:

| | |
|---|---|
| Wise County, Va. Furnace Coke prompt shipment | $3.25 to 3.50 per ton |
| Wise County, Va. Foundry Coke | 4.00 to 4.50 per ton |
| Pocahontas Furnace Coke prompt shipment | 3.25 to 3.50 per ton |
| Pocahontas Foundry Coke | 3.50 to 4.00 per ton |
| Connellsville Furnace Coke prompt shipment | 3.25 to 3.50 per ton |
| Connellsville Foundry Coke | 4.15 to 4.50 per ton |
| New River Foundry Coke on contracts | 3.50 to 4.00 per ton |
| New River Furnace Coke, prompt shipment | 2.75 to 3.00 per ton |

†Wise County, Va., Coke on Furnace contracts is sold mainly on a sliding scale basis for pig iron prices on the following basis: $1.70 to $1.75 per ton on $9.00 pig iron, plus 19 to 20 per cent of the advance on pig iron above $9.00 Birmingham.

**Finished Material.**—The market remains good in a jobbing way and prices are unchanged. Retail prices for filling orders here are as follows:

Angles 3 x 3 and over, 2.15c to 2.25c; beams and channels 15 inches and under 2.15c; small angles and architectural channels, 2.10c base; plates ¼ inch and heavier, 2c; 3-16 inch, 2.10c; No. 8, 2.10c; sheets (blue annealed) No. 10, 2.15c; No. 12, 2.20c; No. 14, 2.25c; No. 16, 2.35c; box annealed sheets Nos. 18 and 20, 2.50c; Nos. 22 and 24, 2.60c; Nos. 25 and 26, 2.65c; No. 27, 2.70c, and No. 28, 2.80c. Iron and steel bars, 1.95c base; boiler tubes, 6 per cent off base; turn buckle 45 per cent off; rivets, 3.15c base; cold rolled shafting 45 per cent off list; steel tire, 2.10c base.

**Old Material.**—The market remains strong in tone and there is a fair volume of trading. We quote f. o. b. Cincinnati as follows:

| | |
|---|---|
| Old No. 1 railroad wrought, net tons | $18.50 to 19.00 |
| Cast machine and foundry, net tons | 18.50 to 19.00 |
| Old iron rails, gross tons | 26.00 to 27.00 |
| Old steel rails, gross tons | 19.00 to 20.00 |
| Old short lengths, gross tons | 19.00 to 19.50 |
| Old iron axles, net tons | 26.00 to 27.00 |
| Heavy melting scrap, gross ton | 20.00 to 21.00 |
| Stove plate, net tons | 14.00 to 14.50 |
| Wrought turnings, net tons | 12.00 to 12.50 |
| Cast borings, net tons | 9.00 to 9.50 |
| Car wheels, gross tons | 20.50 to 21.00 |

## PHILADELPHIA.

### Insistent Demand for Spot Iron.—Foreign Pig Eagerly Sought.

January 15.

**Pig Iron.**—A notable feature of the present situation is the insistent demands for spot iron, which has led to the asking of all sorts of premiums for such shipment. The supply is, of course, almost nothing, and some of the largest producers have been forced to refuse such orders on the grounds that they have absolutely no iron for sale before July 1. The principal sufferers from this scarcity are small consumers, who are turning in increasing numbers to the use of imported iron. Practically all of the cargoes due to arrive in the next month have already been sold. The market for all grades of iron continues very firm, with an advancing tendency in prices. The heavy buying movement

reported from Pittsburg strengthened the position of sellers greatly. There now seems to be no indication that there will be any recession in prices during the first half of the year at least, and if consumption continues to exceed supply at the present rate, the last half will be equally strong. No exceptionally large orders have been reported during the past week, but prices show a hardening tendency all around. Sales of No. 2 X foundry have been made as high as $27 for prompt shipment, and standard gray forge has moved up under a demand which has shown that it is unusually scarce. Eliminating prices for first and second quarter shipments, which command a premium, the following may be given as about the range for the last half:

| | |
|---|---|
| No. 1X Foundry | $26.00 to 27.00 |
| No. 2X Foundry | 24.00 to 24.75 |
| No. 2 Plain | 23.25 to 23.75 |
| Standard Gray Forge | 22.50 to 23.00 |
| Basic | 24.00 to 24.50 |
| Low Phosphorus | 27.50 to 28.00 |

**New Material.**—Plates have been advanced in price because of the heavy demand, and in all lines business is reported as all that could be wished, orders being heavy and specifications coming forward promptly. Iron and steel bars continue in active demand. Prices may be quoted as follows: Beams, channels and angles according to specifications, 1.83½c to 2c; refined iron bars, 1.89½c to 1.93½c; steel bars, 1.83½c to 1.88½c; plates, 2.13½c to 2.18½c.

**Old Material.**—A weakness in scrap has developed owing to the mills, which seem to have accumulated large stocks, holding off in orders for a time. Large sales of steel scrap have been at a reduction of 75 cents a ton, and most other lines show a loss of about 50 cents a ton. Prices may be quoted as follows:

| | |
|---|---|
| Old steel rails | $19.50 to 20.00 |
| No. 1 steel scrap | 19.00 to 19.50 |
| Old steel axles | 23.00 to 23.50 |
| Old iron axles | 31.00 to 32.00 |
| Old iron rails | 27.00 to 27.50 |
| Old car wheels | 22.00 to 23.00 |
| Choice scrap, R. R. No. 1 wrought | 22.50 to 23.00 |
| No. 1 yard scrap | 19.50 to 20.00 |
| Machinery scrap | 20.50 to 21.00 |
| Low phosphorus scrap | 23.00 to 23.50 |
| Wrought iron pipe | 16.75 to 17.25 |
| No. 1 forge fire scrap | 16.50 to 17.00 |
| No. 2 forge fire scrap, ordinary | 12.00 to 12.50 |
| Wrought turnings | 16.00 to 16.50 |
| Axle turnings, heavy | 16.50 to 17.00 |
| Cast borings | 13.50 to 14.00 |
| Stove Plates | 16.75 to 17.25 |

## BIRMINGHAM.

### Delayed Orders and Freight Advance Impending Stimulate Production.

January 14.

There can be no denying the fact that Alabama pig iron manufacturers are exerting every effort to get out as much of the product as possible this month. There is much delay on orders, brought about by the railroad car shortage during the last three months of the past year. In addition to this stimulating factor, the advance in freight rates will positively go into effect on Feb. 1 and it is desired to avoid that as much as possible. The improvement in the transportation facilities in Alabama, while only slight, causes a better feeling. It is announced on good authority, however, that not more than one-half, if that much, of the accumulated iron can be moved out during this month. Railroad officials are doing all in their power to improve the conditions in regards to the service. In addition to bringing new cars to the divisions hereabouts, a number of foreign cars, from western and northern railroads, are noticed in this section and they are being used at every opportunity.

There is a steady demand for iron for delivery during the last half of the year. Prominent sales agents of manufacturers assert that there is an inquiry for a large quantity of iron and that plenty of time is being given for delivery, showing that the melt for the year will be as large as, if not larger than, it was in 1906. Quotations continue firm, No. 2 foundry iron delivery during the last half of the year, selling at $18.50 and $19 per ton. As far as can be learned there is no iron selling in Alabama now under $18 per ton, No. 2 foundry basis.

There is practically no iron to be bought for delivery during the first three months of the year. The second quarter iron is bringing over $20 and $21 per ton.

## BUFFALO.

### Market More Quiet With Sales Few.—New Furnaces Rumored.

January 15.

**Pig Iron.**—Firm prices and few sales were the most important features of the past week's market. The lull in business does not surprise the furnace men for it was what they expected would follow the unusual activity experienced during the early winter. Such spurts in this district are generally followed by a quiet period, and the fact that the market has been so closely bought up for the first half and the amount of sales for second, and even third quarters, emphasize this feature of the Buffalo market. No spot tonnage has been offered by the local furnaces this week and it is generally conceded that there is no more iron for second quarter. The rush for third and fourth quarter iron has subsided for the time being. Very few sales for this period were made.

Sales are reported by agents of outside interests, Mahoning valley iron being placed here at $23.15, including freight to Buffalo, last half delivery. The foreign iron market is quiet, and prices remain unchanged. For more than a month past sales of foreign iron have been made in this district, relieving, from time to time, the famine conditions. Thus far foundries have not been obliged to close down, but lately several of them had to turn tight corners. Prompt delivery iron, in small quantities at the time the foundries were running close, saved the day for them. If car deliveries are not hampered, foundries here will get through all right. Delays in delivery have not been so numerous of late, the railroads finding it possible to furnish cars about as soon as needed for shipping.

For the last half delivery we quote as follows:

| | |
|---|---|
| No. 2 Plain Foundry | $22.00 to 23.00 |
| No. X Foundry | 22.50 to 23.00 |
| No. 3 Foundry | 22.00 to 23.50 |
| Malleable Bessemer | 23.00 to 23.50 |
| Gray Forge | 21.50 to 22.00 |
| Charcoal | 25.00 to 26.00 |

## NEW YORK.

### Limited Buying of Pig Iron.—More Structural Orders.

Office of THE IRON TRADE REVIEW. Room 1315, No. 150 Nassau St., Jan 15

**Pig Iron.**—The seaboard markets for pig iron have been far from active during the last week, but basic consumers have been in the market, with some contracts closed for delivery during the first quarter of the year. The inquiries have probably aggregated 50,000 tons or more, but only about half this tonnage has been actually placed, including one lot of 15,000 tons at $24, furnace, for first quarter delivery. There also have been sales of 1,000 to 3,000 tons for immediate shipment at $25 at Lehigh valley furnaces. Some of the contracts have been made on an exchange basis, of scrap and pig for steel. The conditions attached to these deals make it impossible to give the exact tonnage. At present there is one buyer in the market for 10,000 tons for prompt shipment, and another for 5,000 to 10,000 tons for April shipment.

Forge iron has developed a weaker tone with sales by southern furnaces to manufacturers of railway equipment at lower prices, and at the close northern forge is also lower, probably not over $22.50 for early shipment. Moderate sales of foreign Middlesboro and Scotch iron have been made for immediate and early shipment. A somewhat easier tone

has prevailed with sales of Scotch ranging from $24 to $25, and No. 3 Middlesboro at $22.50 on dock, New York.

| | |
|---|---|
| Northern Foundry No. 1 | $26.00 |
| No. 2 Foundry | 23.50 to 25.50 |
| No. 2 Plain | 23.00 to 25.00 |
| No. 1 Southern Foundry | 23.50 to 26.00 |
| No. 2 Southern Foundry | 23.00 to 25.50 |
| No. 3 Southern Foundry | 22.00 to 24.00 |
| No. 4 Southern Foundry | 21.50 to 23.00 |

**Finished Material**—Interest continues to be centered in structural and fabricated steel, orders being placed for about 16,000 tons by various railroads, mainly for bridge material, including 1,500 tons for the Great Northern and 700 tons for the Rock Island, both of which orders went to the American Bridge Co. The Louisville & Nashville placed orders for 3,200 tons divided among the American Bridge Co., the McClintic-Marshall Construction Co. and the Louisville Bridge Co. One order was also placed by the New York Central for 8,000 tons of structural steel which was awarded to the McClintic-Marshall Construction Co., while the Denver & Rio Grande gave an order for 900 tons to the Pennsylvania Steel Co. The Chicago & North Western placed a structural order for 350 tons with Wood & Allen and the contract for extending the New York *World* building, requiring 2,000 tons, was awarded to D. C. Weeks. The St. Paul R. R. business for 8,000 tons is still pending, as well as 4,000 tons for the Chicago & North Western.

There have been freer offerings of open-hearth billets by dealers who have had conversion deals with the mills. One sale of 5,000 tons is reported at over $32.00 delivered, and another of 5,000 tons at $30.50 at an eastern mill.

There has been less activity in iron bars. It is claimed that sales were recently made for shipments extending over three months at 1.65c, but for current business, mills are holding out for 1.70c to 1.75c, Pittsburg basis.

### ST. LOUIS.

**Pig Iron Prices Harden—Increased Inquiries for Last Half.**

January 14.

**Pig Iron.**—While prices have not advanced to any degree in the last week there has been a hardening all along the line, due rather to a confidence in the future, rather than to any decided buying. Inquiries are coming in in better volume for the second half, but heavy buying for that period has not yet set in. Enough has been done, however, to establish the price firmly at $18.50 with $19 demanded by many furnaces.

There is no longer much distinction between first and second quarters. The price runs from $22 to $23 for No. 2 Birmingham with $1 to $1.50 premium asked for immediate shipment. Sometimes better than this is done for iron on track in East St. Louis, but this is regulated solely by the need of the consumer and his willingness to pay.

One of the steel foundries bought 1,000 tons of basic and another 500 tons for immediate delivery. It is understood that both foundries are in the market for good round tonnages for the second half.

Quotations for this quarter, including the present freight rate of $3.50 from Birmingham, range as follows:

| | |
|---|---|
| Southern No. 1 | $26.50 to 27.00 |
| Southern No. 2 | 26.00 to 26.50 |
| Southern No. 3 | 25.50 to 26.00 |
| Southern No. 4 | 25.00 to 25.50 |
| Gray Forge | 24.50 to 25.00 |

**Coke.**—Coke is somewhat easier than last week and buying was not so good. Orders were based on $4.15 to $4.35 Connellsville.

## Metal Market

### NEW YORK.

January 14.

**Copper.**—A strong tone has continued to prevail for refined copper in both domestic and foreign markets. For a few days there was quite an active demand for electrolytic for shipments, prior to May, and while as high as 25c was obtained for small lots of spot, very few important sales were made over 24½c; moderate transactions for May shipment were made at 24c delivered thirty days. Lake copper has continued to bring about ¼c over electrolytic; while casting grades have ranged from 23½c to 24¼c the outside price for spot, in Europe there has been a moderate demand for both electrolytic and lake for nearby shipment. The exports of copper from Atlantic ports since Jan. 1 have been 7,264 tons, indicating about 16,000 tons for the month.

**Pig Tin.**—Tin has continued erratic with a see-saw movement which has resulted in a slight advance in the London market and a slight decline at New York.

One feature of interest has been the decline of £7, 10s. on spot as compared with futures. Arrivals for the month to date, 1,710 tons, afloat, 2,075 tons. The London market closed Monday at £189 for spot and £190 10s. for futures, an advance of a little over £1 during the week.

**Lead.**—There has been but a moderate demand for pig lead in the local market, holders asking 6.30c for spot, while sales have been made for shipment from the west in January and February at 6.05c to 6.10c St. Louis. Refined spelter has been steady with sales for shipment from the west at 6.60c to 6.65c St. Louis, while spot has been difficult to buy under 6¾c per pound, New York.

### CHICAGO.

January 14.

Active buying of copper was experienced this week, and both grades have advanced. Casting is now quoted at 26½c, carload lots, and lake, 26⅞c. Less than carload lots from ¼c to ½c higher. Pig tin is weaker, and is now held at 44c. Lead, desilverized, is without change at 6.50c to 6.60c for 50-ton lots; corroding, 7.25c to 7.35c for 50-ton lots; car lots, 2¼c per 100 pounds higher. Spelter is in good demand and has advanced to 6.98½c. Sheet zinc has also advanced 15c per pound, and is now quoted at 8.40c La Salle in car lots of 600-pound casks. Antimony is firm at 28½c for Cookson's, and 26½c for other grades.

On old metals, we quote dealers' buying prices, as follows: Copper wire, 19¾c; heavy copper, 19¼c; copper bottoms, 18½c; copper clips, 19c; red brass, 18½c; red brass borings, 15¼c; yellow brass, 15c; yellow brass borings, 13¼c; light brass, 11¾c; lead pipe, 5.50c; tea lead, 5c; zinc, 5c; pewter, No. 1, 28c; tin foil, 34c; block tin pipe, 27½c.

### ST. LOUIS.

January 14.

Lead and spelter are both higher than last week. Missouri brands of lead are firmly held at $6.10 with $6.05 bid. No sales were reported today and there has been little doing all week. Spelter is nominal at $6.70. It is scarce and in demand.

Lead and zinc ores were advanced 50 cents a ton in the Missouri-Kansas field last week. The increase in shipment for the first two weeks of the new year indicate an increase in the year's tonnage of 28,150 tons of zinc and 8,756 tons of lead.

### WINS TITLE TO ORE.

By the decision returned last week by Judge W. A. Cant, of the district court of St. Louis county, Minnesota, the Clark Iron Co., and the American Iron Co., and the Leonard Iron Mining Co., its sub-lessees, have successfully defended their title to valuable ore lands against the heirs of James M. Rogers, who had sought to recover damages on the charge that the lands had been fraudulently obtained from them. The case attracted a great deal of attention among iron men through out the ore country, not only because of the fact that the Clark and Leonard mines were estimated to be worth over 4 million dollars, but also because the decision in the action might cover similar cases in other title transactions in that country about which there has been more or less doubt.

# THE IRON TRADE REVIEW

**Devoted to Iron and Steel Manufacture and to the Machinery, Metal-Working and Foundry Trades.**

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The index for volume xxxix is now completed, and will be mailed to all who request it. The index is not sent to subscribers, unless they so request, or have done so in previous years. Beginning with the issue of Jan. 3, the reading pages will be numbered consecutively through the first half of the year, and THE IRON TRADE REVIEW will hereafter be published in two volumes every year, an index being furnished with each volume.

## THE FAR FUTURE OF IRON PRODUCTION.

The admirable paper by Dr. William Kent published in THE IRON TRADE REVIEW last week showed in a most convincing way the existence of a simple law in the increase in pig iron production. This increase has startled men of today just as men of a generation ago were startled by the rate of increase in those days. A quarter century ago pig iron production in the United States had been increasing at the rate of about 7.9 per cent per year, and to this date it has been doing the same. While the increase was formerly measured by hundreds of thousands of tons a year, it is now measured by millions of tons, but the percentage is the same. Each ton of iron sold and put to use helps to sell another ton. Dr. Kent's courage in making predictions at present is strengthened by his seeing the verification of predictions he made on this same subject years ago.

The existence of this law of increase is so clearly shown that it is entitled to sober discussion in all its bearings. Laws of this sort have their limtis. They cannot be carried to their mathematical limits as can the curves in general geometry. The line of this law had its origin in a haze and some time in the future the line of curvature of actual production will depart from it, suffering a change in the direction of curvature. When will that departure occur? Dr. Kent speaks with a measurable degree of confidence, and rightly, for the years through 1920. As a diversion, he carries the figures to 1950, showing a conclusion which he denominates startling, but he asks "Who can say it is not possible?"

Dr. Kent's law of an increase averaging 7.9 per cent per year is derived from certain premises, those being the production of pig iron in 1866 and the production in 1906, covering a period of 41 years. In the intermediate years the production shows a truly remarkable conformance to the curve.

In the year 1866 a considerable quantity of commercially usuable material in the form of wrought iron, was being produced direct from the ore, in Catalan forges and otherwise, without the intervention of the pig iron form. The quantity of material thus failing to pass through the form of pig iron became quite inconsequential some 20 years or more ago. To this extent the statistics of pig iron, in the early years, were not absolutely representative of the commercial use of iron products. Then, again, in those early years we were importing, whereas now we are exporting. There were two bulges in the import movement, culminating in 1872 and 1880, respectively, in which years the pig iron equivalent of the imports, in whatever form, well exceeded one-half the domestic production of pig iron, but if one refers to Dr. Kent's diagram it will be seen that those were years in which the line of production passed above the line drawn by the law. They were years of heavy railroad building, and the departure illustrates the principle he referred to.

The law cannot be assailed in this direction, because it is distinctly put forth as the law of increase in production of pig iron in the United States, and as such it makes its own convincing argument. It may be of interest to consider the relation of American consumption with production, and, necessarily, the connection which American production has with the production and consumption of the world at large. A line constructed to represent American consumption of iron, not simply of that iron which passed through the form of pig iron, but also of that which was made direct from the ore, would for a number of years beginning with the starting point in 1866 run one or two million tons above the line of production; from 1896 to 1897 it would pass under it, and at the close of the period would be found, in the past three years, to run from a million to a million and a half tons below it. The whole line would be tilted, with an intermediate point as the center. Its configuration would be substantially the same, but the rate of increase would be, say 5.5 per cent, or slightly less than the increase in pig iron production. In Dr. Kent's diagram it is to be observed that up to 1892 the line of production passes above and below the line fixed by the law, passing its time quite impartially on each side, but from 1892 on it stays below, until it meets the line in 1906. This meeting is not chance; the lines are made to meet. If the present were regarded as a boom period, like those from 1871 to 1874, 1880 to 1883 and 1886 to 1892, the recent period could be considered one of production above the average, and a line could be drawn which would make the line of production pass part of its time on each side of it, from 1892 to the present. This, again, would somewhat diminish the rate of increase.

In an effort to discover the limit of application of Dr. Kent's law, regard must be had for the international iron

situation. The three great iron countries, the United States, Germany and England, have been increasing their production, the United States very rapidly, Germany at a relatively moderate rate, and England slowly. The United States long ago passed England and Germany; lately Germany has passed England. The production of the world has increased, but not so rapidly as that of the United States. Our domestic consumption has increased, but not so rapidly as our production. We are supplying more and more iron to foreign countries, but there is a measurable limit to which this expansion can go. With comparative ease we have captured a foreign trade of well over a million tons a year, and we have done it with such ease largely because England and Germany were very busy. It will not be so easy to increase our exports, when England and Germany become more anxious to increase theirs. The total international iron trade, outside of that of the three great countries with each other, is measured by but a few million tons; we have more than a million tons of it; we could at best capture but a very few million tons more, and that is not much when we are making more than twenty-five million. We cannot, then, expect to grow very rapidly through exports.

The iron age, if measured by the time in which it has been gaged with million-ton units, is not a century old. In 1850 the world produced less than 5,000,000 tons of pig iron, and probably not much more than that of all iron products. Civilization is thousands of years old. Some of the older civilizations would really have not so much to learn from us, especially outside of this lavish employment of iron, but iron is really only an incident. The iron was stored in its present form in the ground in geological ages, relatively recent as geological times go, but, unless one accept the meteoric theory, its existence in one form or another in the earth is contemporaneous with the existence of other materials forming the earth's crust. Through thousands of years of civilization, the iron lay in the ground, until well within the past century man began taking it out of the ground, removing the impurities and converting it to his uses. He takes coal, petroleum and gas from the ground and consumes them; he consumes wool, cotton and grain as fast as they can be grown; he consumes wood faster than it is being produced. He does not consume the iron; he puts it to use. Increasing quantities of scrap are coming upon the market; the amount of scrap passing through steel works, rolling mills and foundries is increasing more rapidly than the production of pig iron. It is true some iron is lost, but the great bulk, once taken out of the ground, is merely put into use. To supply the actual waste, and meet the increase in population, would require but a fraction of the present production. For every man, woman and child in the United States at present there has been made, within the past 20 years, and not exported, almost three tons of pig iron. The bulk of this is in existence and performing useful work. At the present rate of production a ton is being added every three years. There is a limit to the amount of iron which can be used per capita.

The present is the age of utilization. Suddenly man formed a desire to use this iron which nature stored in the ground. He is putting it into use, and producing more and more as he discovers his needs. The period of heavy production, relative to use, will pass, while the age of use and replenishment will continue. The turning point may come in a quarter century or a half century; it will hardly be longer deferred, putting aside one of all the centuries as the period in which man converted the iron to his use.

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The Jones & Laughlin Steel Co. has placed a contract for ten immense blowing engines with the Allis-Chalmers Co., the contract having been taken through J. Weidman Murray, Pittsburg representative of the Allis-Chalmers Co. The blowing engines will be exact duplicates of those in use at No. 5 furnace of the Eliza group of the Jones & Laughlin Steel Co.

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A. B. Holmes, secretary of the Independent Pneumatic Tool Co., of Chicago, also became treasurer of the company, Jan. 16.

## GREAT STRENGTH

### Characterizes the British Iron Trade at the Opening of the New Year.

Office of THE IRON TRADE REVIEW, Prince's Chambers, Corporation St., Birmingham, England. Jan. 1, 1907.

The new year has opened with the iron trade in a condition of remarkable strength, sellers having succeeded in defying every effort to depress the market. There have been, quite recently, strenuous endeavors to "bear" prices, and last week they met with temporary success, Cleveland pig iron falling about two shillings, but prices very quickly recovered, and buying is going on as merrily as ever. American and German pig iron contracts cover the first quarter of the new year. The decline in Cleveland stocks was, during December, 10,342 tons, bringing the amount to 539,605 tons. The stocks have been reduced since March by 210,490 tons, and the December shipments were by far the best on record. During the third week of the month Glasgow sold 225,500 tons and London 120,000 tons. Cleveland warrants have risen within the past few days to £3 2s 4d ($15.26). No. 4 foundry is £3 2s ($15.22), and No. 4 forge £3 1s ($14.92). The principal trouble of the smelters at present is the extreme scarcity of coke, which, during the years, has increased from 17s. 6d. ($4.28) to £1 2s 6d ($5.50) equal to from 25 to 33 per cent, and nearly all this advance has taken place since the beginning of November. The present prices of coke are extraordinary, sellers asking £1 6s ($6.36) per ton at the Middlesborough furnaces. Owing to this scarcity, some of the Middlesborough furnaces have had to go on slack blast during the holidays, and smelters have done what has not been known since the Durham strike of 1892; they have bought Yorkshire coal at 16 shillings ($3.81) a ton to assist the furnaces. A scarcity of ore is also being experienced in Cleveland, where furnace owners have bought Northamptonshire iron-stone at the high price of nine shillings ($2.20) per ton. The transfer to slack blast will mean a larger quantity of low-class iron turned out, and the effect of this will be seen almost immediately when all the works are again in full operation, and the scramble for material recommences.

It is generally agreed that the state of trade leaves no room for pessimism. The various railways are laying hands on all the railway carriages and wagons that can be produced,

and during the last fortnight there have been many complaints of inability to get material conveyed with sufficient celerity. Demand is coming from all directions from new tramways, new tube railways and hundreds of offices and factories in London and the provinces that are being practically built of steel. Then there are great new docks and new harbors being built, and today comes the news that an enormous electrical plant is to be built at Bombay for the generation of electricity by water power stored in the Western Ghauts mountains, the machinery for which is expected to reach a value of three-quarters of a million.

Great scarcity is being experienced in the lighter metals, one effect of which is a most exhaustive inquiry in all directions for waste products and especially tin boxes used by grocers, confectioners, tobacconists and others. Less than five per cent of these are returned, and marine store yards are being scoured for these refuse deposits. The latest rumor is that the big wheel lately taken down from Earls Court was being transformed into tobacco boxes. Of course this is an exaggeration, but it is a fact that Messrs. Cohen, who bought the wheel, are rolling out the metal for various purposes, and it is understood that the favoring boom which came almost immediately after the purchase, has made the transaction a very profitable one. It is remarkable that during the Christmas holidays, very good orders were booked, although works were practically at a standstill. It was only in very urgent cases that the mills were running. It is now certain that substantial advances will be made at Quarter Day. The explanation of the action of cold blast dealers in not putting up their iron recently is now clear. They intend to declare a double advance at Quarter Day on the 10th inst. Among other goods marked for advance are marked and unmarked bars, iron and steel wire, and almost certainly sheets and strip. It will almost be safe to say that the advances will be general covering all sorts. Owing to the increase of miner's wages, advances of a shilling to one and sixpence have already been declared. The galvanized sheet trade is maintaining its wonderfully strong position, as shown by the increase in exports during November of 5,000 tons as compared with last year. This was almost entirely due to the increased requirements of Japan, and British South Africa.

## BANNER YEAR

### Celebrated by the Buffalo Foundrymen's Association.—Educational Work.

The annual meeting and banquet of the Buffalo Foundrymen's Association were held Monday evening under very pleasant circumstances. Thirty-five members of the association were present. It was an informal evening from start to finish and keenly enjoyed by everyone. All the officers of the Buffalo association were re-elected unanimously. Lyman P. Hubbell is president, William H. Burr, vice president; George M. Trefts, treasurer; Thomas L. Richmond, Henry D. Miles, Edward Kener, with the president and vice president, comprising the executive committee. John E. Gorss is secretary. He is elected by the executive committee and it was announced after the meeting that Mr. Gorss would be chosen again.

Reports of the several officers show the association to be in a most satisfactory condition. Work accomplished during the past year, especially that which pertained to the molder's strike, was of a decidedly important character. Interests represented by the association are enjoying a high degree of prosperity and the general expression of the members and officers indicated that the past year was the banner year of achievements of the association. During the year twelve foundries became open shops either immediately or soon following the strike of May 2, 1906. These, with eight others which had already adopted open shop rules successfully, and altogether employing between 85 and 90 per cent of the total number of molders working in Buffalo, combine in making Buffalo an open shop city. There are a dozen foundries remaining, however, which cannot be classified as open shops. Under the new state of affairs in this district results of the most satisfactory nature have been attained.

O. P. Briggs, president of the National Foundrymen's Association, was the guest of honor at the banquet. This was held in the palm room of the Lafayette hotel. Secretary T. W. Hutchins accompanied Mr. Briggs. When the foundrymen had dined, Mr. Briggs was called upon and spoke briefly but to the point, his remarks striking the mark every time. In a practical way Mr. Briggs took up the question of education among men in the mechanical departments of the foundries. He expressed in no uncertain terms the necessity of enlightening the employes, arguing that it would bring about a better condition in the shops, less friction among the workmen and a desirable understanding between the foundrymen and their employes.

O. P. Letchworth, spoke when Mr. Briggs concluded. He took up the sentiments of the national president and fully concurred in them. It is evident from what Mr. Letchworth had to say that the plan of encouraging the men along educational lines was one to which the Buffalo foundrymen would give their heartiest support. Secretary Hutchins, of the National association also addressed the foundrymen, taking up the educational problem and reviewing the situation comprehensively.

## LARGE LOCOMOTIVE WORKS

### To be Erected by Alabama Consolidated.—Other Southern Projects.

Birmingham, Ala., Jan. 14.—There are no reasons why the Alabama industrial section should not be on an extensive boom. Joseph Hoadley, president of the Alabama Consolidated Coal & Iron Co., has just completed a tour of inspection of the company's properties in this state. In a public speech before the Birmingham Commercial club, Jan. 11, he announced that a big locomotive works, to cost not less than three and a half million dollars would be erected at Gate City, near here. He further announced that he had recommended to the directors of his company the erection of iron and steel works at Lewisburg, a mining place six miles from Birmingham, the plants to cost something like a million and half dollars, and also the erection of a two-hundred-and-fifty-ton ice factory at Gate City, near here. He expressed the belief that work on the industries would be started in the next few months.

**Plant Will be Sold.**—By order of the court, the steel plant of Howe, Brown & Co., Penn avenue and 17th street, Pittsburg, will be sold at master sale on Monday, Feb. 18, at 4 p. m. William Wishart, 434 Diamond street, Pittsburg, is master and will have charge of the sale. No bid will be received less than $500,000.

An increase of 6 to 20 cents raily in wages for 375 locomotive engineers has been granted by the Boston & Maine railroad.

## CEMENT USERS AT CHICAGO.

**Third Annual Convention Well Attended.—Officers Re-elected.**

The National Association of Cement Users held its third annual convention at the Auditorium hotel, Chicago, Jan. 7 to 12. The meeting developed a very large attendance and interesting discussions. The papers read and discussed embraced a great variety of subjects on the manufacture and uses of concrete, the most interesting being entitled: "Mechanics of Reinforced Concrete" by Professor W. K. Hatt, Purdue university; "Forms for Concrete Construction' by Sanford E. Thompson, consulting engineer, Newton Highlands, Mass.; "Simple Tests for Determining Value of Materials for Use in Mortar and Concrete," by William B. Fuller, consulting engineer, New York; the report of the committee on "Testing Cement and Cement Products," by E. S. Larned, chairman; and the report of the committee on "Fireproofing and Insurance," E. T. Cairns, chairman.

The election of officers for the coming year and the selection of the location for the next convention provoked neither discussion nor strife. President Humphrey announced that he had some time ago received a request that the 1908 convention be held in Atlantic City, and as no other suggestions were offered, it was decided to leave the matter with the executive committee for decision.

With but one exception all the old officers were re-elected. J. H. Fellows, Scranton, Pa., second vice president, asked to be relieved of further service, and his place was taken by M. S. Daniels, Suffern, N. Y. The officers for the ensuing year are therefore as follows: President, Richard L. Humphrey, Philadelphia; first vice president, Merrill Watson, New York; second vice president, M. S. Daniels, Suffern, New York; third vice president, O. U. Miracle, Minneapolis; fourth vice president, A. Monsted, Milwaukee; secretary, W. W. Curtis, Chicago, treasurer, H. C. Turner, New York.

**Blast Furnace Dangers.**—Julian Kennedy, dean of the Pittsburg engineers, delivered an address before the Engineers' Society of Wetsern Pennsylvania Tuesday night on "Blast Furnace Construction," his paper going particularly into details, with the end in view of avoiding danger connected with tops of blast furnaces and dangers of slips and explosions. His address, which was illustrated by a series of drawings, was of particular interest, coming as it did immediately after the accident at No. 2 Eliza furnace of the Jones & Laughlin Steel Co.

## ENGINEERS' ANNUAL BANQUET.

The annual banquet of the Engineers' Society of Western Pennsylvania, was held at Hotel Schenley Saturday evening, Jan. 12, and about 400 engineers and their friends were present Isaac W. Frank, president of the United Engineering & Foundry Co., made an admirable toast-master, and introduced the following speakers and subjects: Geo. W. Guthrie, mayor of Pittsburg, "Municipal Activities;" Judge D. Shafer, judge, court of common pleas, "Law and Engineering;" Walter M. McFarland, vice president, American Society of Mechanical Engineers, "National Engineering Societies;" Henry P. Bope, vice president, Carnegie Steel Co., "Commercialism;" James F. Hudson, editor Pittsburg *Dispatch*, "Recollections."

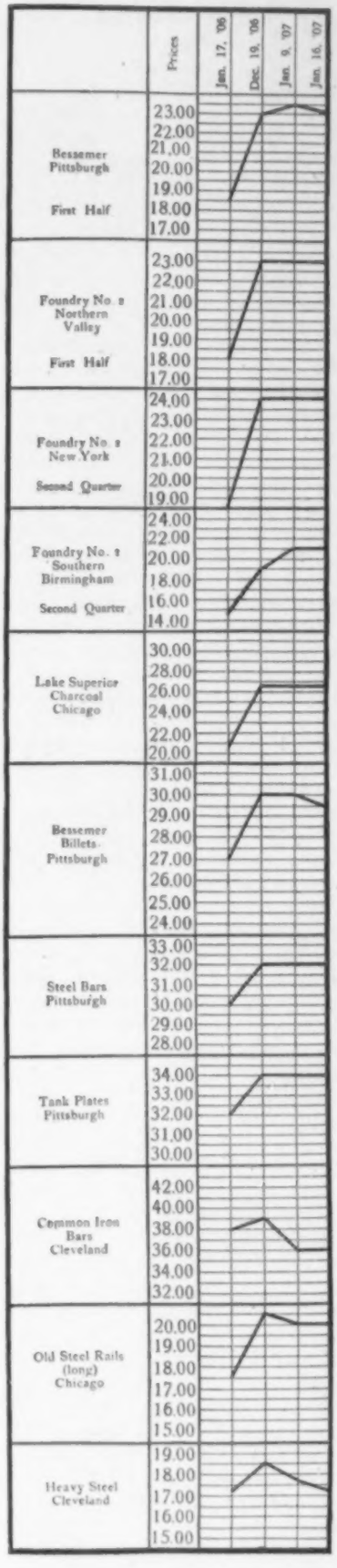
The speech of Col. Bope attracted more than ordinary attention on account of his views on the action of the government officers against large corporations and so-called trusts. He maintained that the great majority of business men today are honest, true and upright and that they are guided by the highest principles of morality and integrity in their dealings with each other, the rantings of the "yellow press" notwithstanding.

## LARGE ORDER FOR GAS PRODUCERS.

The largest order for gas producers ever awarded has been given to the Wellman-Seaver-Morgan Co., Cleveland, by the United States Steel Corporation, and calls for 64 Hughes mechanical gas producers for its Duquesne steel works. These producers are to be driven by electric motors, and are equal in gas producing capacity to 160 hand-poked producers. The Hughes mechanical producers attract the attention of steel makers because they require no hand-poking, give a better quality and more uniform supply of gas and in battery require less room than the hand-poked type of producer.

**Josephine Furnace Lighted.**—The new Josephine furnace of Corrigan, McKinney & Co., located at Josephine, Indiana county, Pa., was blown in Jan. 14, and will run on foundry and gray forge iron. This new furnace has a capacity of 350 to 400 tons a day, and is located on the P. R. R. and B. R. & R. roads with stations and sidings from each. The company is now opening up its coal lands in this immediate vicinity and within a short time will begin the erection of a large number of coke ovens.

## PRICE CHART.



## COMPLETE VICTORY

### For Foundries in Toledo.—Excellent Work of the Metal Trades' Association.

Toledo, Jan. 15.—After six months' strike in five of the principal Toledo foundries, as follows: Ricard Boiler & Engine Co., the C. E. Sutton Co., the Merrell Mfg. Co., the National Supply Co., Baker Brothers Co., and the Ensign Foundry Co., the plants are running full force and as non-union shops, they are in position to take on any outside work and continue business as heretofore.

The Toledo situation was unique in that these five foundries had to stand absolutely alone as they were not members of any association, but formed themselves into the Toledo Founders' Association under the guidance of the Toledo branch of the National Metal Trades Association. The victory was so clear cut that it is regarded by other factories here as a remarkable victory. There were perhaps thirty or more assaults made with the result that several men were arrested, and in one case in particular, now under consideration by the courts, in which it is charged a party shot with intent to kill, and will in all probability be convicted. The Toledo Founders' Association guarantees to any manufacturers who may choose Toledo as a site in the future, freedom from labor troubles if they will enroll under the banner of the Founders' Association.

Upon the opening of the Toledo branch of the National Metal Trades' Association, the Machinists' Union immediately picked Toledo as a likely place to weaken the reputation of the National Metal Trades' Association. The attack was launched at the Pope Motor Car Co., of this city, which was struck because it refused to reinstate two men who were discharged for cause, in creating disturbance in the shop. Fortunately the company was a member of the Metal Trades' Association and received its support with the result that it has an entirely new organization in its shop and has completed more cars at this period of the year than heretofore. The company is building a much better car, embodying better material and better design than at any time in the history of the Toledo plant. The men were first boarded in the plant and after two and one-half months, the shop was practically filled by the N. M. T. A., and the shop running better than before.

Owing to the dismal failure of the strike at the Pope Motor Car Co., the Machinists' Union looked for some loop hole to crawl out, and immediately instituted a demand for a ten per cent increase in wages and a minimum rate of 30 cents per hour, with the request in some of the shops that the minimum be waived if they would recognize the union.

The result is that the "Golden Rule" shop, which is supposed to be one of the best managed shops in the city and run on a straight eight hour day, paying a good wage rate, giving the men a dividend on their yearly pay at Christmas time, a week's vacation on full pay, and setting aside $10,000 of the capital stock of the company, proceeds of which are used for the benefit of the employes, finds that after all it is only a question of the domineering practice of radical unionism; and owing to the refusal of this unjust demand the shop was struck. This plant is not an N. M. T. A. shop nor is the Kent machine shop which was also struck, although it was paying a good rate of wages. Several of the N. M. T. A. shops were struck with the result that in two shops one-half of the men went out, and in the other only one-third of the men quit work.

These arbitrary demands have drawn the attention of the public, waking it up to the fact that unionism is not all that it should be. All shops in Toledo in the Metal Trades' Association will be open shops in every respect, and hereafter any manufacturer in this line of business coming to Toledo may look for the fullest support and guarantee that he will not meet labor troubles unless he encourages them himself.

### Molders' Strikes Settled.

The molders' strike which started in New Orleans, La., early in May, 1906, has been settled by the offer of the foundrymen to pay the men who are worth it, $3.25 a day, and they are to work with the independent men who have been in the foundries all summer, says the National Founders' Association. The original demand was for a $3.50 minimum and the closed shop. "The principle of the open shop was emphatically understood" write the New Orleans proprietors. Two shops will remain non-union, and four will be conducted on the open shop plan. The president and secretary of the local union in a published statement declare that they do not regard the return of the molders to work as a victory for the men.

During the past few days the molders' union has called off strikes in four foundries at Indianapolis, one at Cincinnati and one at Bay City, Mich.

## NEW ENGLAND FOUNDRYMEN.

### Annual Meeting and Banquet at Boston a Most Enjoyable Event.

The annual meting and banquet of the New England Foundrymen's Association held at the Exchange Club, Boston, Jan. 9, will be remembered as one of the most enjoyable events of the association since its organization, eleven years ago.

The annual meeting was held in the afternoon and was attended by members from all sections of New England, while there were several in attendance from outside territory. The meeting was called to order at five o'clock by President W. B. Snow. The report of the secretary indicated a total membership of 121 firms. The treasurer reported a balance on hand and all bills paid.

The nominating committee, comprising Henry A. Carpenter, B. M. Shaw and Geo. H. Gibby, made its report for officers for the ensuing year, as follows, the report being presented by Mr. Shaw: President, Wm. H. Bense, Kinsley Iron & Machine Co., Canton, Mass.; vice president, Henry F. Arnold, American Tool & Machine Co., Hyde Park, Mass.; Secretary, Fred F. Stockwell, Barbour-Stockwell Co., Cambridgeport, Mass.; treasurer, Geo. H. Lincoln, G. H. Lincoln & Co., Boston, Mass.

Executive committee: A. L. Lovejoy, Becker-Brainard Milling Machine Co., Hyde Park, Mass.; H. E. Wetherbee, Jas. Hunter Machine Co., North Adams, Mass.; J. L. Anthony, Weir Stove Co., Taunton, Mass.; H. W. Fernald, Rogers, Brown & Co., Boston, Mass.; Wm. J. Breen, Hugh W. Adams & Son.

It was voted that the members proceed to ballot for officers for the ensuing year and the vote was unanimous for the ticket as presented.

President-elect Bense was escorted to the chair and expressed thanks for the honor conferred upon him. The following new members were unanimously elected, all having been approved by the executive committee: Androscoggin Foundry Co., Auburn, Me.; Wollaston Foundry Co., Wollaston, Mass.; Putnam Machine Co., Fitchburg, Mass.

On motion of the secretary, Mr. Stockwell, it was voted that a committee of five be appointed to look into the alleged discrimination in the matter of freight charges as applied to southern iron. The chair appointed Henry A Carpenter, of A. Carpenter & Sons Foundry Co., B. M. Shaw, of Walker-Pratt Mfg. Co., Fred F.

Stockwell, of Barbour-Stockwell Co., Arthur Gibby, of Gibby Foundry Co., and Geo. H. Lincoln, of G. H. Lincoln & Co.

Announcement was made that the February meeting of the association would be held at New Haven, Conn., and arrangements for it would be left in the hands of a committee comprising the Connecticut members of the association, of which A. N. Abbe, of the American Hardware Corporation, is chairman. The meeting then adjourned.

The banquet in the evening was more largely attended than that of any previous year, the committee of arrangements being showered with congratulations on the manner in which the affair was carried out. There were about 120 members and guests seated at the banquet tables. President Bense welcomed the guests and members in a very happy manner. He then presented Henry F. Arnold, of the American Tool & Machine Co., as toastmaster, who introduced as the distinguished guest and speaker of the evening, Hon. Samuel L. Powers, Boston, who delivered a very humorous speech which elicited frequent outbursts of enthusiasm. At the conclusion of his remarks the members were entertained by a musical entertainment which rounded out a most enjoyable and memorable evening.

## THIRTEEN KILLED BY FURNACE ACCIDENT.

On Wednesday evening, Jan. 9, No. 2 furnace of the Eliza group of the Jones & Laughlin Steel Co., Second avenue, Pittsburg, broke out at the bosh and the entire contents of the furnace, including 300 tons of molten iron, flowed out and engulfed the workmen engaged in the vicinity of the furnace, and up to this time 13 have died. The cause of the accident is unknown. Although the officials of the company have made a careful investigation, they cannot find any explanation satisfactory to themselves. There was no visible explosion preceding the break of the furnace, and as nothing was thrown from the top of the furnace, it was thought there was no slip. The circular pressure dial showed no unusual pressure, the record indicating evenly up to the instant of the break, when it ran down to nothing. No. 2 furnace was considered by the Jones & Laughlin Steel Co. one of its best blast furnaces, having been thoroughly rebuilt and relined about two years ago, and at that time the retaining outside bands about the bosh were made of unusually heavy material.

## TWO NEW CHICAGO STACKS.

### International Harvester Co. and Federal Furnace Co. Will Increase Output.

The International Harvester Co. has broken ground for the erection of a new blast furnace at its South Deering steel plant, near Chicago, which will have 400 tons daily capacity. The furnace will be built from the designs of Julian Kennedy, of Pittsburg, and when completed, will increase the company's pig iron output to approximately 30,000 tons a month. The contracts for the machinery have not yet been signed, though some have been verbally let. The new stack will be built in line with the two present furnaces, provision having been made for the same when the last furnace was erected. No increase is contemplated in the Bessemer department, the present equipment of two 10-ton converters being sufficient, with a few minor changes, to take care of the increased pig iron capacity. The new Morgan continuous bar mill, consisting of eight stands of 16-inch rolls and three stands of 14-inch rolls being installed at the Deering plant is rapidly nearing completion and will be placed in operation within the next few weeks. This mill will have a capacity of 6,250 tons a month.

Contracts are now being awarded for the second stack of the Federal Furnace Co., at South Chicago. Like its predecessor, this will have a capacity of 10,000 tons a month. It is expected the present furnace will be blown in next week. In making plans for the first stack, the power plant, handling equipment, etc., were designed for a two-furnace plant.

## PRICES FOR 1906.

(Continued from page 1.)

the year; a continuance of prices upward during 1901; a rapid advance during the first half of 1902; a sharp decline beginning in the fall of 1902 and continuing during 1903, followed by three years of prosperity and prices steadily advancing, with few recessions, up to the close of 1906. The fact which we noted last year, of the increasing tendency to keep away from extremely high or extremely low quotations, has been emphasized during the past year, especially in the case of finished materials. For example, beams and tank plates, which soared very high in 1895, 1899 and 1902, have shown comparatively little change since 1903. Bar iron has shown the greatest fluctuations of any of the finished products. The spread between Bessemer pig iron and Bessemer billets was $5.00 at the beginning of 1895 and $8.00 at the close of 1906.

## OBITUARIES.

Joseph C. Rogers, New York manager for the Pittsburg Steel Plate Co., was found dead in bed recently while on a visit to his boyhood home at Upton, Mass. Death was caused by heart disease. His age was 62.

Robert Alexander Duncan, aged 66, one of the pioneer stove manufacturers of Pittsburg, died recently at the home of his sister, Mrs. James H. Mitchell, in Wilkinsburg. At one time he was active as a producer of petroleum in the Oil City district.

James Clayton, one of the pioneer manufacturers of air compressors in the United States, died at his home at 119 Henry street, Brooklyn, N. Y., recently. He came from his birthplace, Homer, England, 57 years ago, and started in the manufacture of air compressors between the years of 1864 and 1867. He was widely known in manufacturing circles.

Noah W. Gray, for many years prominently identified with the iron industry in the Lake Superior region, died at his home at Marquette, Mich., late last week after a few day's illness with pneumonia. He was born at Romeo, Mich., Jan. 10, 1847; was educated at Dickinson academy in Romeo and at the University of Michigan. He went to Marquette first in 1873 and built Carp furnace in conjunction with William Burt. He remained there two years, returning then to Romeo and later becoming connected with the Peninsular furnace at Detroit. Mr. Gray left Detroit to take the management of the furnace of the Ashland Iron & Steel Co. at Ashland, Wis., where he remained for a number of years. He returned to Marquette in July, 1899, and associated himself with Charles H. Schaffer in the reconstruction of the Carp furnace. He had made his home at Marquette since that time. The Carp furnace was sold a few years ago to the Pioneer Iron Co., and Mr. Gray and Mr. Schaffer organized the Boyne City Charcoal & Iron Co., rebuilding at Boyne City the charcoal iron furnace formerly located at St. Ignace. Mr. Gray was secretary and treasurer of the company, which has its headquarters in Marquette. Mr. Gray's illness was known to but a few business associates and intimate friends, and the news of his death came as a distinct shock. His business integrity, pleasing personality and many good qualities made him many friends and his loss is sincerely mourned.

A. M. Castle, president A. M. Castle & Co., iron and steel jobbers, Chicago, has gone to San Francisco with the intention of opening an office there. R. L. Sanford will represent the company in that territory.

## PERSONALS:

John P. Nicholas has succeeded Julian L. Yale as selling agent for the Lackawanna Steel Co. in the Chicago district.

Charles M. Brown, secretary of the Colonial Steel Co., of Pittsburg, has been elected a director of the South Side Trust Co. of that city.

C. Ridderhof, manager of the Wilmarth-Morman Machine Co., Grand Rapids, Mich., has resigned to move to California, where he will go into business.

James Gayley, first vice president of the United States Steel Corporation, who was taken ill in Pittsburg recently, has returned to New York. Mr. Gayley's indisposition was slight.

Peter A. B. Widener, director of the United States Steel Corporation, has been ill at his home near Philadelphia. The latest reports from his bedside are that he is steadily improving.

Phillip C. Moore, formerly with the Washington Coal & Coke Co., at Dawson, Pa., has been made general sales agent of the Pickands-Magee Coke Co., Frick building, Pittsburg.

William C. Moreland, secretary of the Jones & Laughlin Steel Co., and A. M. McCrea, president of the Union Steel Spring Co., have been elected directors of the First National Bank of Pittsburg.

Francis F. Coleman has joined the Lidgerwood Mfg. Co., 96 Liberty street, New York, as publicity manager. He was formerly with the Westinghouse and Allis-Chalmers companies and recently with the Traylor Engineering Co.

Thomas McDonald, superintendent of the Ohio plant of the Carnegie Steel Co., at Youngstown, O., was given a pleasant surprise by the heads of the various departments of the plant by being presented with a traveling bag just before his leaving for a European trip Jan. 5.

Odley H. Hartsuff, who has been superintendent of the rolling department of the Carnegie Steel Co.'s mills at New Castle, Pa., has been promoted to be superintendent of all the Carnegie interests in New Castle. He takes the place of John Oursler, recently promoted to the position of district manager of the Carnegie Co.

Announcement has been made by the Woodstock Iron & Steel Corporation, Norfolk, Va., of the appointment of J. W. Porter, of Birmingham, Ala., as auditor; C. A. Carpenter, of Birmingham, purchasing agent; H. T. DeBardeleben, manager of ore mines and furnaces, Nashville, Tenn., and L. B. Parsons, manager of ore mines, Birmingham.

Howard M. Post has accepted the position of advertising manager with the Quincy, Manchester, Sargent Co., manufacturer of railroad appliances, which has offices in Chicago and New York with factories at Chicago Heights., Ill., Milwaukee, Wis., and Plainfield, N. J.

The Warren Steel Co., of Warren, Ill., has elected officers for the ensuing year as follows: C. F. Taylor, president; L. C. Russell, vice president; E. H. Morris, secretary; R. C. Cullen, treasurer. The directors are: C. F. Taylor, L. C. Russell, E. H. Morris, W. J. Sincox, R. C. Cullen, Charles Phillips and Levi Buser. The trustees are R. C. Cullen and L. C. Russell.

Francis E. Norris has been made superintendent of the Sharon and South Sharon plants of the Carnegie Steel Co., at Sharon, Pa., under John S. Oursler, district general superintendent of the mills at Sharon and New Castle. Mr. Morris has been acting as assistant to William H. Lewis, former superintendent of the Sharon plants who resigned Jan. 15.

C. W. Comstock, who has been purchasing agent for the Wellman-Seaver-Morgan Co., resigned Jan. 1. Mr. Comstock has been appointed district sales manager for the Chandler & Taylor Co., of Indianapolis, and will be located in Cleveland. His office will be in the Caxton building, adjoining those of Comstock-Jones & Co., in which concern he is also intersted.

At the annual election of the Champion Iron Co., at Kenton, O., the following directors were elected: Dr. G. J. Carter, H. T. Miller, W. J. Armstrong, George E. Crane and Lloyd Carter. In the election of the board Dr. G. J. Carter was made president and treasurer; W. J. Armstrong, vice president; Lloyd D. Carter, secretary; George E. Crane, attorney, and T. A. Taylor, superintendent.

J. A. Barnhart, of Scottdale, Pa., purchasing agent for the H. C. Frick Coke Co., was toastmaster at the first annual banquet, reception and dance of the Frick Veterans' Association, at Connellsville, Pa., Jan. 9. One hundred and thirty veteran coke makers from all parts of the Connellsville region attended. Those who spoke were Thomas Lynch, president of the H. C. Frick Coke Co.; C. P. Parker, of Pittsburg, auditor of that company, and James Anawalt, of Pittsburg, president of the Union Supply Co.

Westley R. Mason, district manager of the American Car & Foundry Co., has severed his connection with that concern and accepted the position of second vice president and general manager of the Dominion Car & Foundry Co., Montreal, Que. Mr. Mason entered the car building industry as a clerk in the office of the Peninsular Car Co. When that concern merged with the Michigan Co., making it the Michigan-Peninsular Car Co., he went with it as cashier and was afterward paymaster and assistant treasurer. The absorption of the Michigan-Peninsular Co., by the American Car & Foundry Co., brought Mr. Mason to assistant district manager and finally to district manager, David W. Hawksworth, who is also connected with the American Car & Foundry Co., goes with Mr. Mason to become manager of the mechanical department of the Dominion company.

## A NEW SUPERINTENDENT.

H. J. Lamborn has been appointed superintendent of power and plant in The Yale & Towne Works, to succeed F. A. Waldron, who resigned about a year ago. The position is a very responsible one, requiring not only executive ability, but also the training of an engineer and broad technical experience. Mr. Lamborn was born in Philadelphia in 1873, and graduated first from the Philadelphia High School, and later from the Towne Scientific School of the University of Pennsylvania in the course of mechanical engineering. For three years he was associated with John C. Trautwine Jr., in editorial work for the *Civil Engineer's Pocket Book;* then for four years connected with the engineer department of the United States on harbor and fortification work near Philadelphia, and then for a year with the Hyatt Roller Bearing Co. as mechanical engineer. Since 1902 he has held the position of mechanical and electrical engineer and superintendent of the magnetic separating plants of Witherbee, Sherman & Co., at Mineville, N. Y.

S. E. Dauchy, who has been acting superintendent of power and plant during the past year, and for several years has held the position of assistant superintendent, will continue in the latter capacity under Mr. Lamborn.

Charles M. Schwab, President A. J. Johnson and Vice President H. S. Snyder, of the Bethlehem Steel Co., Bethlehem, Pa., have applied for a charter for the Saucon Land & Improvement Co. It is reported that the object of the company is to construct 350 houses for workmen about the plant.

# DEEP MINING ON THE GOGEBIC RANGE.

## REAL VALUE AND EXTENT OF DEPOSITS BEING DISCLOSED.

**Miners Show Appreciation of Improved Conditions.—One Shaft at the Newport Now Down 2,200 Feet.—Features of Different Properties.**

From a geological standpoint, the Gogebic range is the most uniform in its nature of any of the Lake Superior iron deposits, and the various mines of the range are located following the footwall, in a single line of definite direction. The extreme western end beyond Iron Belt has seen but little activity in the past, but this year is being explored at Mellon and Tyler's Fork by the Montreal Mining Co., and further east at the Plumer location the Steel Corporation is sinking a shaft. It is believed that the greater and more mature development of the central portion of the range will be extended before long in as great magnitude to this territory as the result of the exploratory work now being done. The scene of most active operations is at Ironwood, Mich., where the Ashland mine of the Cleveland-Cliffs Iron Co., the Oliver Iron Mining Co. group, including the Norries, Pabst and Aurora and the Newport Mining Co.'s property are indicating more clearly than has ever been possible before, the real extent and value of the Gogebic range deposits. Eastward from the Newport in the seven miles between Ironwood and Bessemer are five active mines. Between Bessemer and Wakefield there are three more, in addition to the present idle Palms. Beyond Wakefield are the large workings of the Brotherton and Sunday Lake mines, the explorations of the Castile Mining Co. and a few long since inactive shafts. West of Hurey, which is but "over the river" from Ironwood, out to Iron Belt, the mines are scattered along at intervals in the following order: Harmony, the Cary group, Ottawa, Montreal, Pence and Atlantic; the Atlantic is scarcely more than an exploration, though much more advanced than the neighboring properties, Plumer, Daylight and Snyder, upon which shafts have just recently been put down for short distances.

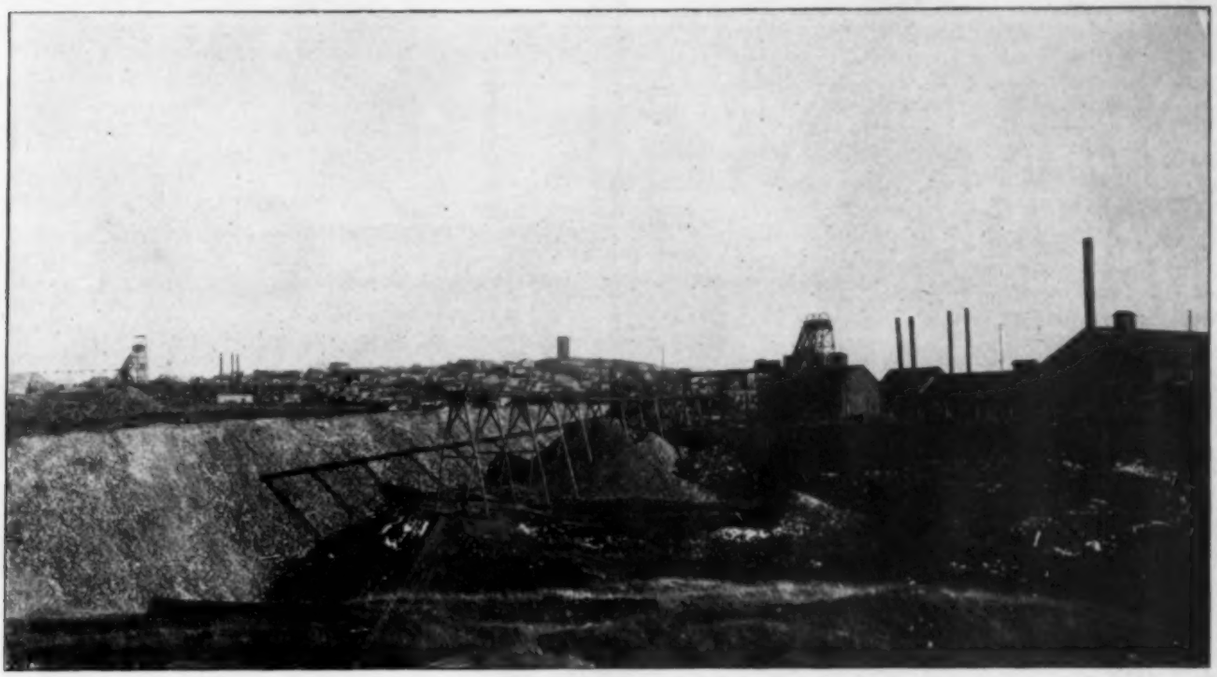


FIG. 1.—THE ASHLAND AND NORRIE SHAFTS.

### The Ashland Shafts.

Fig. 1 is a view to the eastward from Ironwood with the three compartment, steel housed, wooden shaft of the Ashland mine in the foreground, and the Norrie shaft, the largest on the range at present, in the distance. Fig. 2 is a closer view of the Ashland shaft and surface equipment. The Ashland mine, one of the largest on the range, has had in all 13 shafts, the present one with the steel shaft house being No. 9. The mine, formerly under the same ownership as the Harmony, is now operated by the Cleveland-Cliffs Iron Co., being in charge of H. F. Ellard. Underground, the caving system is most largely used, but the mine presents a by no means uniform proposition, the ore occurring in bodies frequently intercepted by the dyke formations common to the range, but in this mine particularly productive of lack of continuity in the deposit. Above ground, a number of novel features have been employed, as may be noted in Figs. 1 and 2. The legs supporting the dock for dumping rock, which is in the immediate foreground of Fig. 1, may be seen set with the large end uppermost. This arrangement applies as well to the docks for the ore stock piles, the idea being that once the legs are covered with ore or rock, the bot-

tom and weaker part is supported, and the greater strain comes upon the upper part of the leg, which, by this arrangement, is the part having the greatest strength. In addition, the taper of the legs is in the right direction, with the small end down, to make the pulling out with steam shovels when the pile is being removed much more easy than with the large end buried. Through this arrangement, those superintendents who have adopted this method have been enabled to use the same old supports for a number of seasons, whereas, before, they were constantly being broken. This same plan is in practice at the Montreal mine. The scheme for running rock waste out on the above mentioned dock consists of a cable-hauled dump car operated from the shaft end of the dock with a mechanical tripper at the dumping end, avoiding the necessity for hand tramming, which means, of course, a great saving of labor.

**Arrangement of Tracks.**

The loading tracks running under the shaft are elevated to avoid not only accidents but any interference which the handling of supplies and materials around the shaft might cause, and, as a result, traffic is perfectly free under the trestle, on which the loaded ore cars are filled. The timber yard is close by the shaft and the timber cars can be run directly to the mouth and on to the cage which has rails of the same gage on its lower deck, so that the timber is transferred from the surface to the bottom of the shaft and into the mine with but the one handling.

The railroad tracks of the mine are owned by the operating company, shipments being made over both the Wisconsin Central and Chicago and Northwestern roads. This practice of mine ownership of switch tracks is not common, but in one or two other instances, is about to be established because of some controversies regarding crossovers between the two roads serving the Gogebic range.

**A Well Equipped Dry.**

At this mine, there is the best equipped dry on the range, and the company feels amply repaid for the effort it has made in providing comfortable quarters for the miners, because of the extent to which the miners take advantage of the better conditions. This dry is a one-story brick building, 25 feet wide by 175 feet long, and is arranged with a dry room at either end, each occupying one-third of the length of the building. In the central portion of the building is a wash room, which includes on one side a row of shower baths. The scheme for drying consists of two rows of steam coils, running horizontally the length of the dry room, over which in the form of a gable are erected pipe racks upon which the miner's clothes may be spread. Sheet iron hoods extending down over these racks with vents through the roof, carry off all vapors and ventilate the dry room completely. The lockers are made of expanded metal, and are of the type coming to be used quite commonly also by the Oliver Iron Mining Co. and others.

**A Record in Rapid Work.**

No. 9 shaft was begun five years ago last November, and is now down to the seventeenth level at 1,550 feet. By July 1, following the November in which work was begun on the shaft, the eighth level had been reached and the first skip load of ore hauled up, something of a record in the matter of rapid work. The other active shaft of the Montreal is the old No. 3 shaft which still has a wooden shaft house. Not a great deal of ore is being hoisted there.

The power plant is located between the two shafts, and has installed a Webster, Camp & Lane hoist of the twin-engine style with five ten-foot drums. Four of these are for skips, two for the No. 3 shaft and two for the No. 9 shaft and one for the cage of the latter shaft.

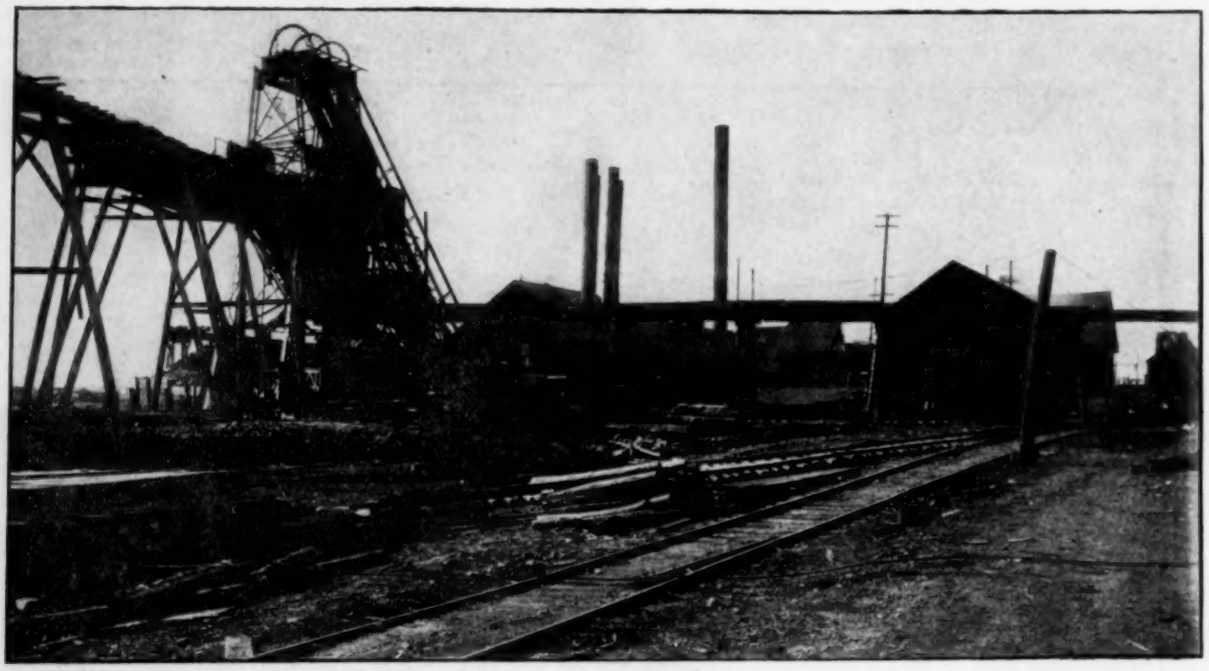


FIG. 2.—NEARBY VIEW OF THE ASHLAND MINE.

**The Norrie Group.**

East of the Ashland mine is the Norrie group, including the Norrie or "A" shaft, North Norrie or "B" shaft, "C" shaft, which is a vertical shaft in the hanging wall, and East Norrie, arranged as shown in Fig. 5. The Norrie is a four compartment steel shaft and has at the present writing the heaviest shaft house on the range.

The Norrie group, which now produces well over a million tons annually, has been considered as a group of mines only since the acquiring by the

Steel Corporation of these shafts, which formerly were operated by independent

FIG. 3.—UNIQUE HEAD FRAME FOR AURORA MINE.

companies. From and including the Ashland mine eastward to the Newport, a distance of about a mile and a half, the workings of these different properties extend adjoining each other, so that there is but one continuous stretch of underground openings for that entire distance. However, the independent operation of each of these at one time resulted in the various levels being opened at different depths at each shaft. Since assuming control, the policy of the Oliver Iron Mining Co. has been to so locate the new levels, as its mines are being deepened, that they will gradually approach a common level, and this point will be reached, it is expected, at the opening up of the seventeenth level. In other words, the seventeenth level in all of the Norrie group, the Aurora and Pabst will be the same depth, and may be made continuous.

**Shaft May Be Abandoned.**

The East Norrie and Norrie shafts are the principal producers of the group, the former in particular. The "C" shaft, which is 1,300 feet deep, is one of the few shafts now down in the hanging, such as it is, of the range, and it is probably only a matter of time before it will be abandoned, as the shafts in the footwall, inclined as they are with the pitch of the vein, are reaching at depths of 1,600 feet, the same ore obtainable through a vertical shaft located as is shaft "C." A further reason, as in the case of the wooden shaft of the Pabst mine, hinges on the lack of solid formation in the hanging, endangering the alignment of the shaft. The East Norrie shaft is 250 feet back in the footwall, is inclined with the pitch of the vien, about 62 degrees, and is 1,100 feet deep, being down to the sixteenth level, which is, as yet, nothing more than an exploration. The fifteenth level is the working level at present, and has installed in the main drift an electric haulage system with Westinghouse motors and two-ton steel cars.

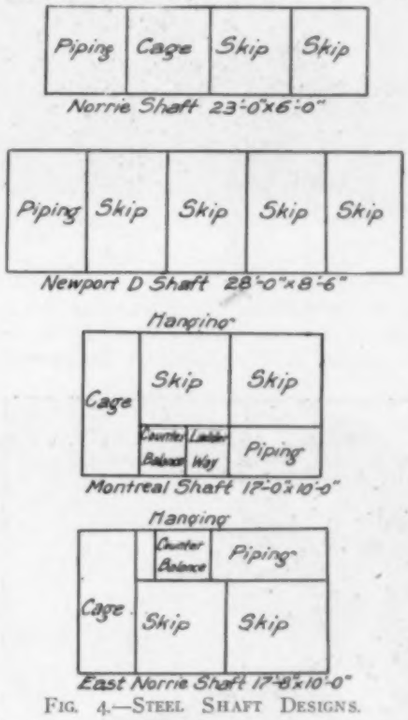



FIG. 4.—STEEL SHAFT DESIGNS.

The feature of these motors is the fact that instead of a trolley pole which would need to be swung around in case the motor was reversed, the wire connection is made by a four-arm flexible frame whose axis is vertical, and which is adapted to running in either direction. The motor as a result may be operated in a much narrower drift where, unless a loop has been laid out in the mine, a trolley pole would not be available. The ventilation of the mine is excellent, all of the steam pipes having been put down in the North Norrie shafts, so that cold air enters through the East Norrie and Norrie shafts, passes through the workings and up through the hotter shaft in the middle. So strong a current of air exists in the East Norrie that on the fifteenth level station a bulkhead had to be built at the shaft end of the crosscut to control the current.

**The Power Plants.**

The power plants are arranged as shown in the sketch, Fig. 5, the one supplying the Norrie and North Norrie shafts consisting of the standard equipment used by the Oliver Iron Mining Co. A new boiler plant of four units has been erected, but the present hoist is one of the twin-engine style built some years ago by the Bullock Co. since acquired by the Sullivan Machinery Co., and has four ten-foot drums geared to one driving shaft. For the East Norrie shaft, there is installed a Bullock engine drive, two drums running in balance, and for the cage a new Sullivan Machinery Co. unit. In both power plants, it is probable that heavier equipment will be installed for handling the skips, as the work below the fifteenth level will be too heavy for the present installation. The cages operated in the Norrie and East Norrie shafts are typical of latest designs, but are quite different from each other. The Norrie cage is perhaps as heavy a one as is manufactured, being entirely enclosed on three sides by metal plates, the East Norrie cage being, on the contrary, an open frame work. These carriers have been known to bring up 80 men at one time. It is hardly considered possible, however, that as many men would

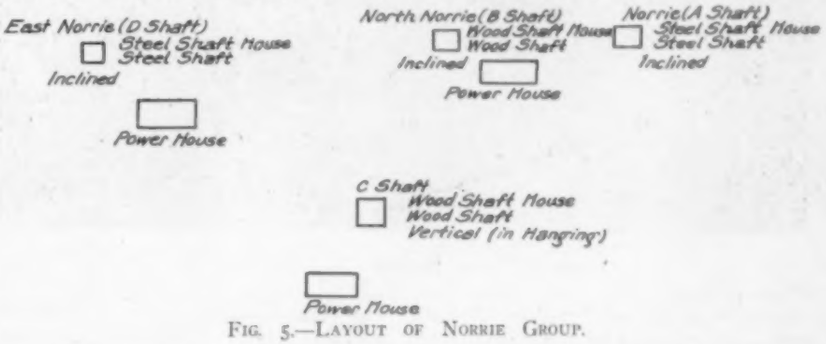



FIG. 5.—LAYOUT OF NORRIE GROUP.

crowd into the cage going down for reasons that are readily understood. The cages have upper and lower decks, the bottom compartment having rails fastened to the floor, so that the lumber cars may be run in and carried down as in the Ashland mine. There are a number of vertical boilers of the Wickes type on the range, one of the installations being at the vertical shaft of the Norrie group.

The Aurora mine adjoins the East Norrie and has two active shafts, one of these with the steel housing shown in Fig. 3. This is a vertical shaft, the other being an inclined wooden shaft in the footwall. Ordinarily, the general design of a shaft house is less dependent upon the location of the hoist and considerations involved in the arrangement of the hoisting cable than upon anything else. In the case of the Aurora shaft, however, as shown in Fig. 3, the shaft house has been designed first of all to meet the requirements of the lateral pull in hoisting, and as a result presents a distinctly unique appearance.

**The Pabst Shafts.**

At the Pabst mine, which now includes the old Vaughn workings, there are to be three shafts, one of which is the wooden vertical shaft in the hanging wall, the second a new steel shaft down 1,100 feet in the footwall, the completion of the shaft house for which came only with the close of the past season. This new shaft is of the same design as the East Norrie, and is an evidence of the expectation that the present depth, 1,100 feet, is but a beginning of the operations which will be developed with the future growth of the mines of this group. Between this new shaft and the Aurora shaft, a third was begun early in November, which is to be similar to the one just mentioned. The vertical shaft, which is down to the same depth as the analogous shaft of the Norrie group, has been considerably damaged by the crushing in of the hanging, and with the beginning of hoisting in the steel shaft it will be repaired. At present, nothing but rock is being brought up out of it.

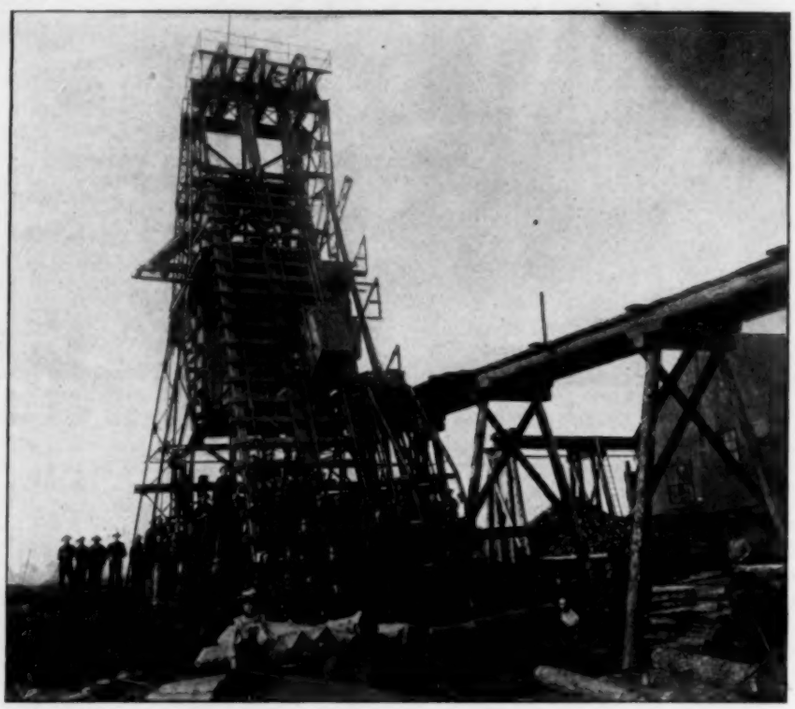


FIG. 7.—ASHLAND HEAD FRAME.

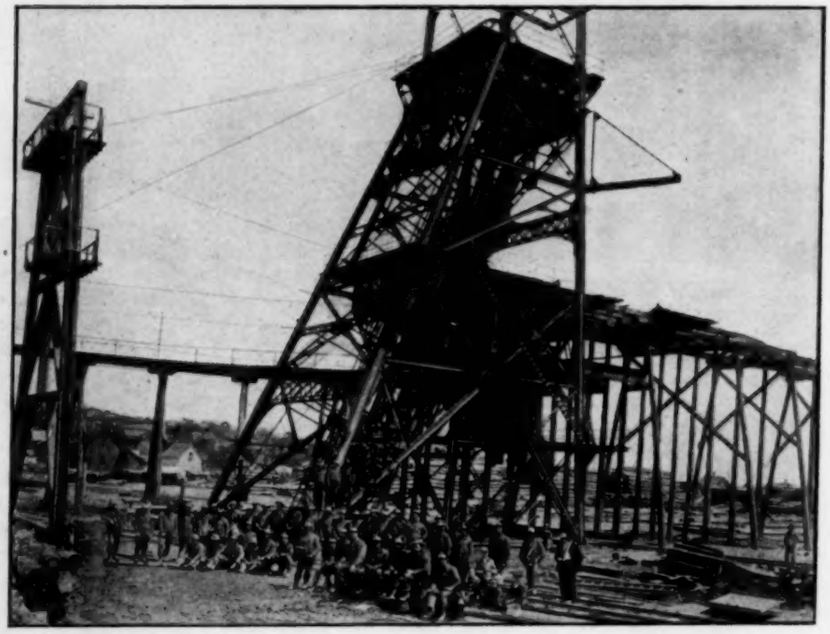


FIG. 6.—EAST NORRIE HEAD FRAME.

A condition, which unfortunately exists at a number of the properties on this range, and which the arrangement of the Aurora shaft is intended to mitigate, that of having the power house removed from the shaft a considerable distance, necessitating a long cable haul and oftentimes two or three turns and sharp angles makes the lay out for the newly completed shaft somewhat less effective than might otherwise be obtained. It is very probable that with the sinking of the third shaft, a new power house will be erected between them and on the south side of the strike, so that the best possible arrangement can be obtained. The shafts in the footwall, being inclined with it, have an angle of inclination of about 60 degrees, the incline being toward the north. Wherever possible, therefore, the hoisting cables are led over the top sheaves to a guide on the south side of the shaft, making the bending of the cable over the top as slight as possible. At present, owing to the location of the old power house, where a new Sullivan hoist is being installed, the cable at the Pabst shaft has had to be brought down on the north side, which makes the angle very acute.

These properties are under the direct supervision of D. E. Sutherland, district superintendent for the Oliver Iron Mining Co.

The Newport mine, owned by Ferdinand Schlesinger, of Milwaukee, and managed by J. R. Thompson, has had a history in the past year or so which is not only interesting, but has had a more important bearing upon the future of the Gogebic range than the operations in any other of the neighboring properties. The original ore body is cut off at a comparatively moderate depth by intruding dykes, but one of the shafts known as "A" shaft was sunk deeper through about 1,000 feet of nearly barren ground with the result that a much larger ore body has been come upon, at a depth of about 2,000 feet, changing, by this discovery, the entire complexion of the mine's operation. A large quantity of water was encountered on striking these lower deposits and in the opening up of the sixteenth level, so that practically nothing was done for a year but the pumping of water which came in at the rate of from 800 to 1,000 gallons per minute. Several shafts have been sunk from time to time, but, at present, only three are active. They are named "A," "B," and "K." The last named is really a separate exploration under the name of Bonnie, and is at some distance to the east of the other shafts. "B" shaft is not used to any great extent for hoisting ore, except such as is being cleaned up from the original ore deposit. All of the present shafts are of wood, but a new and somewhat unusual steel shaft is in the process of construction, and is to be ready for hoisting some time in 1908. This new shaft, which is distinctly a part of the preparations for the larger mining into which the proposition has developed is shown in plan in Fig 6. It will be the longest shaft on the range, 28 feet 8 inches, and will have more compartments than any other. There are to be four skip ways with the provisions for a cage not yet decided upon, though it is probable that one will be placed either above or below one of the skips. The ledge is quite near the surface at the shaft mouth, being down some 20 or 25 feet, so that the mouth of the shaft is lined with concrete. Up to November 1, about 500 feet was the depth attained. A steel shaft house will be erected during the coming season. Attention has been attracted to this shaft because of its extreme length, many engineers being opposed to so great an exposure to the unreliable hanging of the range. The present power equipment, even now more than ordinarily efficient, is to be considerably enlarged. The hoist operating the skip in shaft "A," which is now down to 2,200 feet, runs at the rate of 2,000 feet a minute, making a round trip regularly in two minutes and ten seconds, and having been known to make 24 trips in an hour. The hoist is a first motion Thomas Greer, twin engine design with eight foot drums, 16-foot base. This was installed a little over a year ago. For the new shaft, another power plant is being built, and already a part of the machinery is installed in a temporary structure around which the permanent brick power house is being erected. The machinery at present in place consists of a Nordberg, two-stage air compressor with cross-compound steam ends, which has a capacity of 2,500 cubic feet of free air per minute, being capable of supplying 50 drills at a pressure of 100 pounds per square inch.

FIG. 8.—HEADFRAME OF NOKRIE SHAFT.

FIG. 9.—WOODEN SHAFT HOUSE AT MONTREAL MINE.

Current is supplied for the electrical equipment of the mine by a 150-kilowatt Westinghouse generator, direct-connected to a tandem compound Nordberg engine, which is perhaps the best installation of its kind and size on the ranges. This supplies power both for lighting and for the electric haulage system, which was installed on the fifteenth level in October last. Both engines are run condensing, the water supply being cooled by means of a cooling tower circulation. Two new hoisting engines are to be erected as soon as the power house is far enough along to permit. Other operators on the range are now confidently looking forward for the same experience in their own workings that has come about at the Newport mine.

In Figs. 3, 4, 5 and 6, are shown four types of shaft houses now doing duty on the range. All but one of which are of steel construction. These represent various features that have been demanded by the nature of the workings they are intended to serve, as well as different ideas of the several engineers building them. The one wooden shaft house at the Montreal mine represents as substantial a type of wooden head frame as may be found any place. In Fig. 6, are shown plan views in outline of the various designs of steel shafts, which are being used, or are about to be installed during the next year, and which need no explanation more than that the compartment marked for piping in the East Norrie is not used.

## LEGISLATION RELATIVE TO MINNESOTA MINES.

In his message to the legislature of Minnesota, Governor Johnson makes a number of suggestions pertinent to the relations of the state to the great ore deposits and their control in Minnesota. The governor suggests the advisability of organizing a new state department devoted to the subject of mines and mineral properties, with the creation of the position of state commissioner of mines, placing that commission on an equal basis with similar offices already established. Such a department would perform the duties similarly provided for in other states. To substantiate the suggestion, the governor calls attention to the vast amounts of ore which have been mined and shipped from Minnesota, for which no accounting has been given to the state at all, and he points out the marked confusion existing in connection with mining titles, and particularly as regards state leases.

Governor Johnson also points out that the present royalty of 25 cents per ton for mineral leases of state mines is entirely out of proportion to the increased value of ore today. He says in view of this condition, "the state cannot longer afford to pursue the policy of disposing of its iron ore wealth at prices less than that paid to private individuals." His suggestion is that the minimum royalty on state leases be no less than 50 cents, which is an increase of 100 per cent on the present basis. The taxation of the mines also comes in for a considerable discussion in his message, from the standpoint "that the problem which confronts the state in the taxation of its vast iron ore properties is the practical impossibility of applying to these mines a valuation and tax rate which would cause them to pay a just proportion of taxes on a basis of equality with other property throughout the state." Prior to 1896, the owners of iron mines in Minnesota were assessed on the rate of one cent per ton on ore mined and shipped in lieu of all other taxes. The law under which that system existed was repealed, and since 1896, the mines have been assessed as other real property for direct taxation, with the result that valuation has been increased from year to year, being raised in 1906 from $42,000,000 to $70,000,000. The governor claims that on the basis of the enlarged value of ore in the ground, and the extent of the deposits, this valuation fails utterly to represent the true and equitable valuation of the ore. He points out also that, even though the valuation be raised as it has been from time to time, that does not mean that the return to the state will necessarily be larger inasmuch as the tax rate becomes a variable quantity.

As a remedy for this condition, the governor, after pointing out statistics showing the vast amount of ore handled, and the revenue possible therefrom, suggests an income tax on the royalties paid on mineral rights which are not now listed. He says an income tax of but five per cent on the $6,500,000 of royalties estimated to have been received by fee holders of Minnesota iron lands during the year 1906 would net the state treasury $325,000. To cover those properties, the fee of which is held by the operating company, as, for instance, many of the Steel Corporation's holdings, the governor suggests the devising of a scheme for taxing on the basis of tonnage mined, with due consideration for the value of that ore to the mining company.

In all of these suggestions, the governor has not been unmindful of the problems of providing such a scheme with the dangers of double taxation and other difficulties which have heretofore stood in the road, and in the further details of his message sets forth the situation in as fair a light as possible.

## NEW COMPANY LEASES NEW YORK MINES.

A company has just been formed under the name of the Benson Mines Co. representing interests connected, for the most part, with the Inland Steel Co., which has assumed leases on the Benson mines in St. Lawrence county, New York. The new corporation has a paid-in capital of $200,000 with John C. Eden as president and Wayne Wills, vice president. The directors are Alexis W. Thompson, John C. Eden, Wayne Wills, E. N. Ohl and Henry Cassal. The Magnetic Iron Ore Co., from whom the leases were obtained, was composed almost entirely of heirs of the Benson estate who held the property rights covering 2,826 acres in fee, together with all the mining equipment, concentrating plant and a part of the village of Benson Mines, at which point the office of the new company will be located. In addition to these holdings, mineral rights were acquired under the new leases to about 260,000 acres in St. Lawrence and neighboring counties.

The mines have been idle for some time, but they are said to have shipped during the period of their operation about 150,000 tons of high-grade concentrates, and the intent of the Benson Mines Co. is to prepare the property for operation at as early a date as possible, because of the easy access to furnaces of eastern and western Pennsylvania, many of which are looking to the market for additional ores. It may be expected that the working of the mines will be carried on upon a much larger scale than heretofore, with an anticipated shipment of about 500 tons daily.

The deposit of ore here is of the magnetic outcropping nature found elsewhere in New York state and of considerable extent. The ore is of low grade, running about 33 per cent in iron, though exploration has shown some parts of the deposit to contain from 40 to 45 per cent iron. Concentrated, of course, this ore can be made to yield a product running 64.18 per cent in iron; 1.58 per cent manganese; 0.461 per cent sulphur. The phosphorus content is uniformly low, and for that reason, the ore is particularly valuable.

# THE ART OF CUTTING METALS

(Continued from last week.)

By Fred W. Taylor.

## How to Make and Record Experiments.

We have broadly defined the art of experimenting on this subject as an attempt to hold uniform and constant all of the elements which affect the final results under investigation except the one variable which is being studied, while this one is systematically changed and its effect upon the problem carefully noted.

It is the necessity of holding these variables constant which makes all these experiments so difficult, causes the apparatus and forgings tested to be so large and expensive, and consumes perhaps four-fifths of the time of the experimenter. Time and again in our work it has required days and sometimes weeks to prepare for an experiment which, after we have succeeded in obtaining uniformity in all the elements, has been made in a few days or hours.

A description of how to maintain uniformity of conditions is then virtually a description of the art of experimenting on cutting metals. The writer will, therefore, begin by explaining in detail the precautions which must be taken to secure this uniformity.

### The Metal Which is to be Cut.

In determining the effect which any one of the more important elements has upon the cutting speed,—such, for instance, as the effect of the feed or thickness of shaving upon the speed,—it is necessary to make many standard cuts of 20 minutes' duration in succession for each thickness of shaving, in order to find the exact speed at which the tool will be ruined at the end of 20 minutes. For this reason the information required for each thickness of shaving may cause hundreds of pounds of metal to be cut up into chips; and since in determining the law many different thicknesses of shaving must be experimented with, and the metal cut must be of uniform hardness. In order to obtain accurate results not only a large experimental forging is called for, but the metal throughout the forging must be as nearly as possible uniform.

We have finally adopted as the standard size of forging best suited for experiments a piece about 10 feet long by 24 inches in diameter and weighing about 15,000 pounds. For this purpose we prefer a forging made from a large ingot cast from a carefully melted heat of open-hearth steel, and forged with a large reduction in the diameter so as to obtain as nearly as practicable uniform working of the metal throughout from the outside to the central portions of the forging. This forging in all cases requires thorough annealing, and in some cases an oil hardening previous to the annealing. Before using it experimental standard tensile test bars should be cut from each end of the forging and broken so as to prove the uniformity of the metal, and, if necessary, the metal should be retreated by tempering and annealing until it has been demonstrated, through breaking a sufficient number of test specimens, to be uniform.

Masses of cast iron upon which tools are to be tested should in all cases have their central portion cored out, so that the metal will be cooled from the center outward as well as from the outside inward, thus producing an annular ring of cast iron from three to four inches thick; which, if sufficient precautions are taken to insure regular cooling, will be comparatively uniform throughout. We have used annular masses of cast iron, made in this manner, of 24-inch diameter with 12-inch cores, 12 feet long; of 15-inch diameter, 10-inch cores, 8 feet long; of 13-inch diameter, 7 feet long; of 13-inch diameter, 9-inch cores, 10 feet long. On the whole, we have obtained the most uniform results from a casting of 24-inch diameter, 16-inch core, and 10 feet long, walls of casting four inches thick poured on end. Since the central portion of the annular rings which were six inches in thickness were very materially softer than the outer or inner portions of the ring, we have found it much more difficult to obtain sufficiently large and uniform masses of cast iron than of steel.

A large diameter is called for in both forgings and castings, not only for the sake of obtaining a large quantity of uniform metal, but also to avoid as far as possible the effect of chatter upon the tool, caused by the deflection of the work; and the writer wishes to emphasize the necessity for large masses of metal if the experimenter hopes for trustworthy results.

### The Experimental Lathe.

The large and uniform forgings and castings required in investigating the laws affecting cutting tools call for a large and powerful lathe in which to make the experiments. This machine must be both large and powerful for various reasons:

(A) Our experiments necessitate the taking of cuts with coarse feeds and great depths of cut as well as those with fine feeds and shallow depths.

(B) In all experiments there must be a substantial surplus in the driving and feeding capacity of the machine beyond that which is directly used in taking the cut, so that when the time arrives for the tool to give out, the driving mechanism of the lathe shall be sufficiently powerful to completely grind away that portion of the tool which is cutting without overstraining the machine, and thus ruin the tool.

(C) This ruining of the tool must be accomplished without either diminution of the speed of cutting or any material deflection or yielding either in the forging itself, in the driving mechanism of the lathe, or in the tool or tool post and its supports; or in the feeding mechanism.

In brief, the lathe should be a much more powerful machine in all its elements than that which would be required in the daily process of taking cuts of the maximum sizes which are to be experimented upon.

### The Speed Changes of the Machine.

The lathe should be capable of running at any rate of cutting speed between the limits, say, of 3 and 300 feet per minute. This wide range of speeds is called for through the necessity of taking both light and heavy cuts upon metals in the two cases of extreme hardness and extreme softness. It is also particularly necessary that the driving mechanism should be such as to maintain as nearly as possible a uniform cutting speed throughout the experiment, even though there may be very great variations in the driving power which is used during different parts of the same experiment.

To illustrate: In order to be certain that precisely the same cutting speed is maintained from the beginning to the end of our standard run of 20 minutes, it is necessary, after securing the tool in its proper position in the tool post, to bring its nose into the position which it should oc-

[1]Presidential address, 1906, A. S. M. E.

cupy in order to take the exact depth of cut which the experiment calls for. The speed of the lathe must then be accurately adjusted so that the precise number of feet per minute will be indicated by the "rotameter" when held against the surface of the forging, as described below, and the driving power and speed control of the lathe should be so uniform that when the feed motion of the lathe is thrown into action, the cutting speed of the tool will neither be appreciably increased nor diminished as the lathe

formity in the rate of feed is demanded as in the rate of cutting speed, and the gearing should give as many positive changes in the thickness of the feed as practicable. The feed gearing must be sufficiently powerful to produce a feeding pressure at the cutting edge of the tool equal to the maximum driving presure.

**The Weight of the Machine.**

It is also particularly desirable that all parts of the machine should be sufficiently massive to absorb the slight inequalities in the driving and

This apparatus is illustrated in Fig. 6, in which M represents a 40-horsepower electric motor which is geared to E, a large and powerful pair of "Evans" tapered friction driving pulleys, by means of which a speed variation of one to four can be obtained. B is the belt driving from one set of cone pulleys upon the Evans driving shaft down to the lathe cone pulleys C. From this cone pulley the power is either transmitted directly or through a double train of gears, $G_2$ and $G_3$, to the large geared face plate

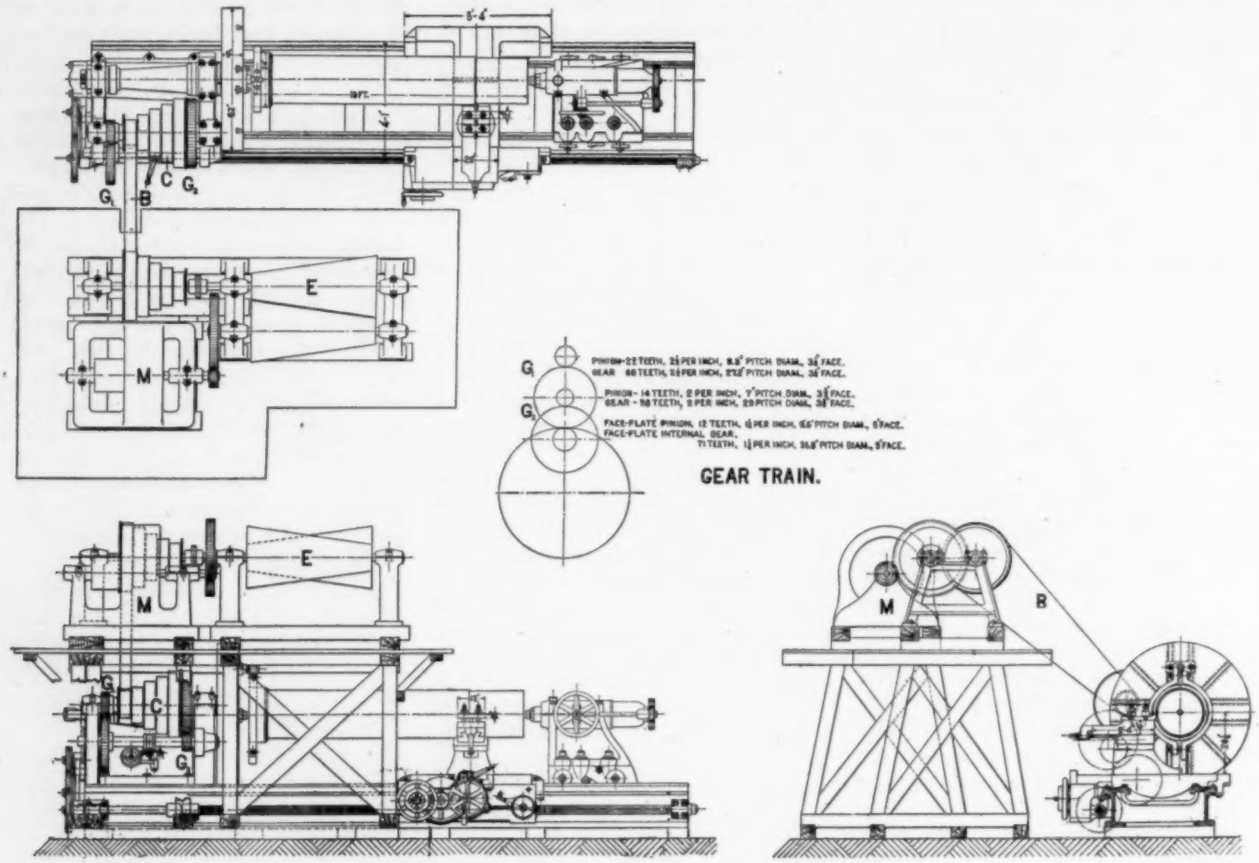



FIG. 5.—EXPERIMENTAL LATHE USED AT WORKS OF BETHLEHEM STEEL CO.

changes suddenly from running without load to running under the full pressure of the cut.

**The Feeding Mechanism.**

Such gearing should be used in the feed motion as will insure absolute uniformity in the feed. On no part of the feed mechanism should apparatus be used which depends for its action upon friction, and the feed mechanism should be sufficiently large and massive not only to advance the tools when under the heaviest cut and when they are dull, without danger of breaking, but to be sure that the tool is advanced at an absolutely uniform rate, whatever may be the feed resistance which it must overcome. In other words, precisely the same uni-

feeding pressures caused both by the minute wavelike variations of the cutting resistance of the chip and any inequalities in the driving mechanism, without allowing these variations to show themselves in the form of chatter in the tool. It is necessary, therefore, that the tool post and its supports as well as the lathe bed should be massive and wide.

**The Best Type of Experimental Lathe.**

We have had at various times some ten different machines fitted up for the purpose of carrying on our experiments. Our best apparatus was that employed in the three years experiments at the words of the Bethlehem Steel Co.

of the lathe, which is 62 inches in diameter. This lathe swings clear of the saddle, a forging 52 inches in diameter, and was designed especially heavy throughout its bed, saddle, head and tail stocks, for the purpose of taking heavy roughing cuts upon steel forgings.

**Measuring the Cutting Speed.**

In Fig. 7 is shown full size an instrument called a "rotameter," which we have found the best appliance for practical use in measuring the cutting speed. The small wheel W, which projects beyond the rim of the rotameter is firmly pressed directly against the surface of the rotating forging. The circumference of the small disk or wheel in the rotameter

moves with the same velocity as the surface of the forging, and through gearing inside of the instrument rotates the two hands upon the face of the rotameter—corresponding to the hands of a watch—one of which points to the feet and the other to the inches of travel. In taking a reading with this instrument, its two hands are set at zero, and a stop-watch is started

FIG. 7.—ROTAMETER.

at the instant that the wheel of the rotameter is pressed upon the moving forging. The rotameter on being removed from the forging at the end of a minute indicates on its face the rate of cutting speed.

Owing to the direction to which the chip runs off of the tool, the rotameter can best be used upon the larger of the two diameters of the forging; and it is our custom to record the speed of the cut as the speed of the forging upon the larger of these two diameters. It is necessary to accurately standardize each of these rotameters before using, and frequently afterward, to be sure that its hands indicate the exact distance the circumference of the wheel travels. This is done by measuring accurately on any smooth surface a distance to say 20 by 30 feet, and running the rotameter along this path by hand.

The speed of the forging should be checked by the rotameter at frequent intervals throughout the test, to be absolutely sure that it does not vary, and in all cases a record should be kept of the exact outside diameter of the forging together with the longitudinal distance which the tool travels in 20 minutes in the direction parallel to the axis of the work. These data enable the experimenter to accurately check the actual average cutting speed maintained throughout the test with the speed aimed at and recorded from the rotameter measurements.

Fig. 8 illustrates an instrument called the "cutmeter," which we have found useful and accurate in measuring cutting speeds. The circumference of the disc W is pressed against the surface of the forging whose speed is to be measured. An increase in the revolutions of the shaft to which this disc is attached causes a proportional increase in the force with which an annular magnet mounted on the same shaft as this disk tends to rotate another disc which forms an armature for this magnet. The rotation of this armature is controlled by an accurately standardized steel spring which tends steadily to bring it back to its zero position. The scale of the instrument, which gives the cutting speed directly in feet per minute, is mounted on the circumference of the armatuer disc, and is read opposite a fine wire in the middle of a glass covered opening in the body of the instrument. Like the rotameter, it must be checked up from time to time to be sure that it remains absolutely accurate.

This instrument would be perhaps, on the whole, the most satisfactory which we know of for measuring cutting speeds were it not for the fact that the makers for some accountable reason have made the wheel W smaller than the body of the cutmeter. This defect renders it awkward to apply in all cases, and impossible for accurate use in many cases. It has, however, two very great advantages: No stop watch need be used; the exact cutting speed can be read on the scale

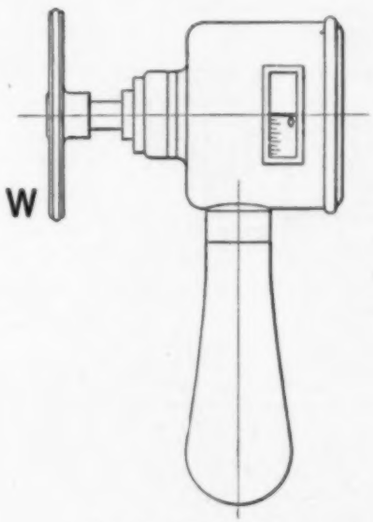



FIG. 8.—CUT-METER.

of the instrument within a few seconds after it is in contact with the work.

As a check upon all mechanical appliances used in determining cutting speed, the speeds should be calculated by measuring the diameter of the forging and counting its revolutions per minute as obtained by making a chalk or other mark upon the circumference of the face plate of the lathe; and by means of a stop-watch noting the time required for the lathe to make a given number of revolutions, say ten or fifty, according to whether the speed is slow or fast. From these data the accurate cutting speed is figured, preferably by the use of a circular slide rule known as the "omnimeter."

At the end of each test we again calculate the actual average cutting speed obtained by ascertaining the average revolutions per minute. This is done by dividing the total travel of the lathe carriage in inches by the thickness of the feed and the number of minutes; and having accurately

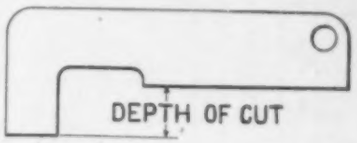


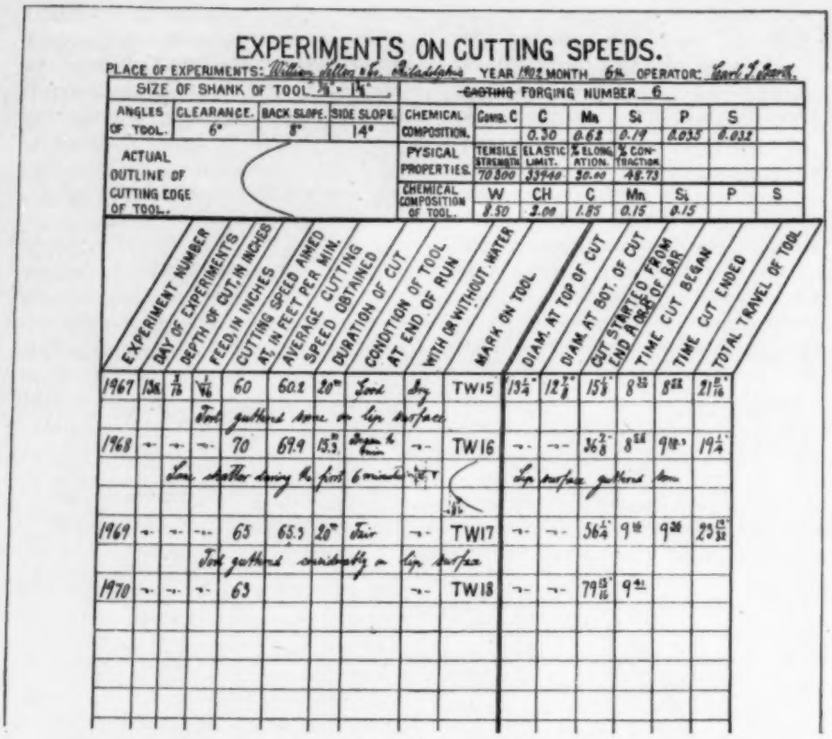

FIG. 9.—DEPTH OF CUT GAGE.

measured the diameter of the work, the cutting speed is quickly figured by the use of an omnimeter.

**Measuring the Depth of the Cut.**

Before starting a 20-minute run, the experimenter should assure himself by accurately calipering the forging that the portion of the test piece about to be cut is of uniform diameter throughout the distance to which the cut will extend. The writer would especially call attention to the error which we at first made, and which he believes has been made by all other experimenters, of attempting to measure the depth of the cut and maintain it uniform throughout the experiment by using calipers. It is out of the question to accurately caliper the forging while it is running at the high speed required for the cut, and with the jar incident to this work, and calipers should only be used on the forging while it is at rest.

Fig. 9 shows a "cut gage" which we have used for maintaining uniform the depth of the cut; a separate gage similar to this is made for each depth of cut to be experimented with. The longer edge of this gage is placed upon the larger diameter of the forging, while the shorter edge, or offset, rests at the same time upon the smaller diameter. By placing it upon the forging in such a position that the light back of it shows between the edge of the gage and the forging the depth of the cut can be maintained with great accuracy. We look upon a gage of this sort as an absolute necessity for maintaining accuracy in this work.



EXPERIMENTS ON CUTTING SPEEDS.

PLACE OF EXPERIMENTS: Williams, Sellers & Co., Philadelphia YEAR 1902 MONTH 6th OPERATOR: Carl G. Barth.

SIZE OF SHANK OF TOOL 3/4" × 1 1/4" CASTING FORGING NUMBER 6

| ANGLES OF TOOL | CLEARANCE | BACK SLOPE | SIDE SLOPE |
|---|---|---|---|
| | 6° | 8° | 14° |

| CHEMICAL COMPOSITION | Cons. C | C | Mn | Si | P | S |
|---|---|---|---|---|---|---|
| | | 0.30 | 0.62 | 0.19 | 0.035 | 0.035 |

| PYSICAL PROPERTIES | TENSILE STRENGTH | ELASTIC LIMIT. | % ELONGATION. | % CONTRACTION |
|---|---|---|---|---|
| | 70300 | 35440 | 30.00 | 48.73 |

ACTUAL OUTLINE OF CUTTING EDGE OF TOOL.

| CHEMICAL COMPOSITION OF TOOL. | W | CH | C | Mn | Si | P | S |
|---|---|---|---|---|---|---|---|
| | 8.50 | 2.00 | 1.85 | 0.15 | 0.15 | | |

| EXPERIMENT NUMBER | DAY OF EXPERIMENTS | DEPTH OF CUT, IN INCHES | FEED, IN INCHES | CUTTING SPEED AIMED AT, IN FEET PER MIN. | AVERAGE CUTTING SPEED OBTAINED | DURATION OF CUT | CONDITION OF TOOL AT END OF RUN | WITH OR WITHOUT WATER | MARK ON TOOL | DIAM. AT TOP OF CUT | DIAM. AT BOT. OF CUT | CUT STARTED FROM END A BASE OF BAR | TIME CUT BEGAN | TIME CUT ENDED | TOTAL TRAVEL OF TOOL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1967 | 13th | 3/16 | 1/16 | 60 | 60.2 | 20m | Good | dry | TW15 | 13 1/4" | 12 7/8" | 15 1/8" | 8 32 | 8 52 | 21 5/16" |
| | | | Tool gathered some on lip surface. | | | | | | | | | | | | |
| 1968 | -- | -- | -- | 70 | 69.9 | 15m | Again 4 | -- | TW16 | -- | -- | 36 2/8" | 8 52 | 9 12 | 19 1/4" |
| | | Low, shatter during the first 6 minutes | | | | | | | | Lip surface gathered some | | | | | |
| 1969 | -- | -- | -- | 65 | 65.3 | 20m | Fair | -- | TW17 | -- | -- | 36 4/4" | 9 16 | 9 36 | 29 15/32" |
| | | Tool gathered considerably on lip surface | | | | | | | | | | | | | |
| 1970 | -- | -- | -- | 63 | | | | -- | TW18 | -- | -- | 79 13/16" | 9 41 | | |

FIG. 10.—SAMPLE SHEET FOR MAKING DAILY RECORDS OF EXPERIMENTS.

It is, of course, a very simple matter before starting on the experiment to turn the smaller diameter on the forging so as to give any exact depth of cut which may be wanted. If, however (after turning the desired smaller diameter), the nose of the tool is then brought so that it is barely in contact with this surface, the instant that the feed is thrown in for the experimental run and the tool starts to cut, the pressure of the shaving will invariably either force its nose slightly further away from the axis of the forging or else draw it a little closer to it and in this way give a shallower or greater depth of cut than that desired.

As before explained, calipering while the forging is running is too inaccurate to enable the operator to readjust the tool so as to again obtain the exact depth of cut, whereas through the use of the cut gage illustrated, the tool can at any time be accurately advanced a little closer to the axis of the forging or drawn away from it, until the exact depth of cut aimed at is attained.

The first move, then, on the part of the operator, after starting his tool on a 20-minute run is to exactly readjust the depth of his cut through the use of the cut gage, and he should next immediately use the rotameter, or the cutmeter in checking the cutting speed. A trifling variation either in the depth of cut or in the cutting speed does not affect the ultimate result of the experiment, provided these variations occur during the first two or three minutes while the tool is warming up and before it has reached its maximum heat. A very slight variation, however, either in the depth of cut or in the cutting speed will be likely to spoil the whole experiment if it occurs, say, after the first two or three minutes of the run. The depth of cut should be checked at least once every two minutes throughout the experiment with the cut gage and oftener as the tool approaches the ruining point.

| | EXPERIMENT NUMBER | MARK ON TOOL | SPEED IN FEET PER MINUTE | DURATION OF CUT IN MINUTES | CONDITION OF TOOL |
|---|---|---|---|---|---|
| FEED | 1" / 16 DEPTH OF CUT | | | | |
| 1" / 16 | 65a | G1 | 84.6 | 20.0 | G |
| | 66a | G4 | 91.7 | 20.0 | G |
| | 67a | G6 | 100.2 | 20.0 | G |
| | 68a | G4 | 105.0 | 5.0 | R |
| | 69a | F4 | 103.6 | 5.5 | R |
| | 70a | F6 | 96.0 | 8.5 | R |
| | 71a | F10 | 103.0 | 20.0 | F |
| | Conclusion | | 103 | 20 | G |
| 1" / 8 | 72a | G1 | 61.1 | 20.0 | G |
| | 73a | G7 | 66.0 | 12.5 | R |
| | 74a | F4 | 65.0 | 8.5 | R |
| | 75a | F10 | 65.5 | 20.0 | G |
| | Conclusion | | 65.5 | 20 | G |
| 3" / 16 | 84a | G1 | 57.8 | 4.5 | R |
| | 85a | G3 | 58.9 | 5.0 | R |
| | 86a | K2 | 43.1 | 12.0 | R |
| | 87a | K3 | 43.4 | 20.0 | G |
| | 88a | K4 | 46.3 | 20.0 | G |
| | 89a | N1 | 46.8 | 6.0 | R |
| | 90a | N2 | 47.1 | 20.0 | G |
| | 91a | N3 | 49.9 | 10.0 | R |
| | Conclusion | | 47.1 | 20 | G |

| | EXPERIMENT NUMBER | MARK ON TOOL | SPEED IN FEET PER MINUTE | DURATION OF CUT IN MINUTES | CONDITION OF TOOL |
|---|---|---|---|---|---|
| FEED | 1" / 8 DEPTH OF CUT | | | | |
| 1" / 16 | 58a | F2 | 63.6 | 20.0 | G |
| | 59a | G1 | 66.6 | 20.0 | G |
| | 60a | F1 | 73.4 | 18.0 | R |
| | 61a | F4 | nick in tool tested | | |
| | 62a | F6 | 71.7 | 20.0 | F |
| | Conclusion | | 72 | 20 | G |
| 1" / 8 | 52a | K2 | 61.0 | 5.0 | R |
| | 53a | E2 | 55.7 | 7.0 | R |
| | 54a | E4 | 47.9 | 10.0 | R |
| | 55a | F1 | 44.2 | 20.0 | G |
| | 56a | F3 | 47.3 | 20.0 | F |
| | 57a | F5 | 47.6 | 8.0 | R |
| | 75a | G4 | 48.8 | 20.0 | G |
| | 76a | G5 | 52.4 | 10.5 | R |
| | 77a | G7 | 50.3 | 9.5 | R |
| | Conclusion | | 48.8 | 20 | G |
| 3" / 16 | 48a | F2 | 45.6 | 6.0 | R |
| | 49a | F10 | 38.8 | 20.0 | G |
| | 50a | G1 | 43.2 | 11.0 | R |
| | 51a | G3 | 42.8 | 15.0 | R |
| | Conclusion | | 40 | 20 | G |

| | EXPERIMENT NUMBER | MARK ON TOOL | SPEED IN FEET PER MINUTE | DURATION OF CUT IN MINUTES | CONDITION OF TOOL |
|---|---|---|---|---|---|
| FEED | 3" / 16 DEPTH OF CUT | | | | |
| | 1a | K2 | 39.6 | 20.0 | G |
| | 2a | K4 | 41.1 | 14.0 | R |
| | 3a | D3 | 42.7 | 20.0 | G |
| | 4a | D4 | 44.3 | 13.5 | R |
| | 5a | D5 | 50.3 | 9.0 | R |
| | 6a | D6 | 45.0 | 20.0 | G |
| | Previously Standardized at 60 feet | | | | |
| | 7a | D1 | 29.6 | 20.0 | F |
| | 8a | E1 | 29.9 | 20.0 | G |
| | 9a | E3 | 34.9 | 20.0 | G |
| | 10a | E4 | 38.2 | 11.0 | R |
| | 11a | E5 | 38.5 | 11.5 | R |
| | 12a | EF11 | 47.0 | 13.5 | R |
| | Conclusion | | 35 | 20 | G |

| | EXPERIMENT NUMBER | MARK ON TOOL | SPEED IN FEET PER MINUTE | DURATION OF CUT IN MINUTES | CONDITION OF TOOL |
|---|---|---|---|---|---|
| FEED | 1" / 4 DEPTH OF CUT | | | | |
| | 19a | K2 | 43.4 | 20.0 | G |
| | 20a | D3 | 49.9 | 20.0 | G |
| | 21a | E5 | 54.0 | 12.5 | R |
| | 22a | E6 | 48.3 | 12.0 | R |
| | 23a | E8 | 51.6 | 20.0 | F |
| | Conclusion | | 51.5 | 20 | G |
| | 24a | E6 | 38.5 | 15.5 | R |
| | 25a | E10 | 37.6 | 20.0 | F |
| | 26a | K6 | 38.4 | 15.5 | R |
| | 78a | I2 | 39.9 | 13.5 | R |
| | Conclusion | | 37.6 | 20 | G |
| | 13a | K6 | broke in 3 min. | | |
| | 14a | D3 | 28.3 | 20.0 | F |
| | 15a | E5 | 30.4 | 20.0 | F |
| | 16a | D6 | 32.4 | 12.0 | R |
| | 17a | E6 | 30.8 | 20.0 | G |
| | 18a | D8 | 33.0 | 7.0 | G |
| | Conclusion | | 30.8 | 20 | G |

| | EXPERIMENT NUMBER | MARK ON TOOL | SPEED IN FEET PER MINUTE | DURATION OF CUT IN MINUTES | CONDITION OF TOOL |
|---|---|---|---|---|---|
| FEED | 3" / 8 DEPTH OF CUT | | | | |
| | 33a | F6 | 39.7 | 20.0 | F |
| | 34a | F7 | 41.2 | 20.0 | G |
| | 35a | F9 | 42.2 | 20.0 | G |
| | 36a | F1 | 43.4 | 20.0 | G |
| | 37a | F3 | 50.6 | 12.5 | R |
| | 38a | F5 | 49.0 | 20.0 | N.R. |
| | Conclusion | | 49 | 20 | G |
| | 39a | D7 | 29.0 | 20.0 | G |
| | 40a | E7 | 33.9 | 10.0 | R |
| | 41a | E10 | 33.9 | 20.0 | G |
| | 42a | F1 | 35.8 | 19 75 | R |
| | Conclusion | | 34.6 | 20 | G |
| | 43a | D7 | 24.8 | 20.0 | G |
| | 44a | F6 | broke in 12.5 min. | | |
| | 45a | F7 | 29.1 | 9.0 | R |
| | 46a | E10 | 26.4 | 10.5 | R |
| | 47a | F8 | 25.8 | 14.0 | R |
| | Conclusion | | 24.8 | 20 | G |

| | EXPERIMENT NUMBER | MARK ON TOOL | SPEED IN FEET PER MINUTE | DURATION OF CUT IN MINUTES | CONDITION OF TOOL |
|---|---|---|---|---|---|
| FEED | 1" / 2 DEPTH OF CUT | | | | |
| | 79a | K10 | tool broke in 1/2 min. | | |
| | 80a | K4 | 39.4 | 20.0 | G |
| | 81a | I3 | 45.0 | 11.0 | R |
| | 82a | G3 | 40.5 | 15.5 | R |
| | 83a | G4 | 43.3 | 20.0 | G |
| | Conclusion | | 43.3 | 20 | G |

TABLE 11.—EFFECT ON CUTTING SPEED OF VARYING DEPTH OF CUT AND FEED IN CUTTING STEEL.
This represents one of the most successful series of experiments made.

**On Uniformity in the Cutting Tools.**

The greatest difficulty met with in experimenting is to insure uniformity in all of the cutting tools which are used in a given series of experiments made, say, for the purpose of determining one of our laws. There are many elements which affect the standard speed at which a tool will just be ruined at the end of a 20-minute run; and in preparing a lot of tools for an experiment, it is not only essential for the experimenter to assure himself that in the making of each tool every precaution has been taken with one element after another to secure uniformity; but, in addition to this, it is necessary to prove by actually running each one in a preliminary tool test that they are all uniform, say, within a limit of about two per cent.

To go into further detail on this point, the following precautions should be taken for securing uniformity in the tools. (The writer refers here particularly to cutting tools made by the Taylor-White process, which have come to be called almost universally tools made from the "new tool steels."[1])

Special precautions should be taken in buying the tool steel from which these experimental tools are to be made, to be sure that it is of uniform quality. The very best and most uniform make of tool steel should be purchased, and the maker should be informed of the important use to which this particular lot of tools is to be put, and should be requested to take special care in mixing and melting the steels to be sure that they are uniform in their chemical composition, and subsequently in the hammering and annealing of the bars. A chemical analysis either of each bar, or, at least, of the heat of steel from which the bars are forged, should be made. The same care should be taken in the dressing and subsequent heat treatment of each of the tools to see that they are all alike. It is of special importance that the tools should be ground slowly, and that a very heavy stream of water should be directed throughout the operation of grinding directly upon the cutting edge of the tool, so as to absolutely avoid the danger of overheating the tool at the cutting edge in grinding. More high-speed tools are daily injured in our machine shops through overheating in grinding than in any other way, and this injury is all the more serious because it can only be detected after the tool has been used in the machine by its failure to run at the proper speed.

The tools must be ground so that they have noses of the same size; so that the curve or contour of the cutting edge is of exactly the same shape in each tool; and so that the clearance and lip angles are all alike. It is entirely possible for a skilled grinder, with the use of especially made gages, to grind all of these tools to their proper shapes by hand on an ordinary grindstone or emery wheel,[2] but this process is exceedingly slow and requires a good deal of skill.

If practicable, therefore, the tools should all be ground with an automatic tool grinder having a "former" of the exact shape of the cutting edge. The writer has found it desirable, however, in almost all cases, in preparing a set of experimental tools, to appoint an inspector to stand over the man who was running the automatic grinder to absolutely assure himself that these tools were ground

[1]The expression "new tool steels" is absolutely misleading, since the novelty lies in heating these tools to the melting point or nearly so, and in the other heat treatments explained in the Taylor-White patents, and not in their chemical composition; because tool steels which were appropriate to this treatment were sold in the market long before Mr. White and the writer discovered that high speeds could be obtained through heating them to the high heat. "High heat tools" or "modern high speed tools" describes them much better.

[2]The writer himself, in his early experiments, spent days in grinding his experimental tools to the right shapes, and it was this experience which first led him to appreciate the necessity for an automatic tool grinder in a machine shop, and then to design one and put it into use.

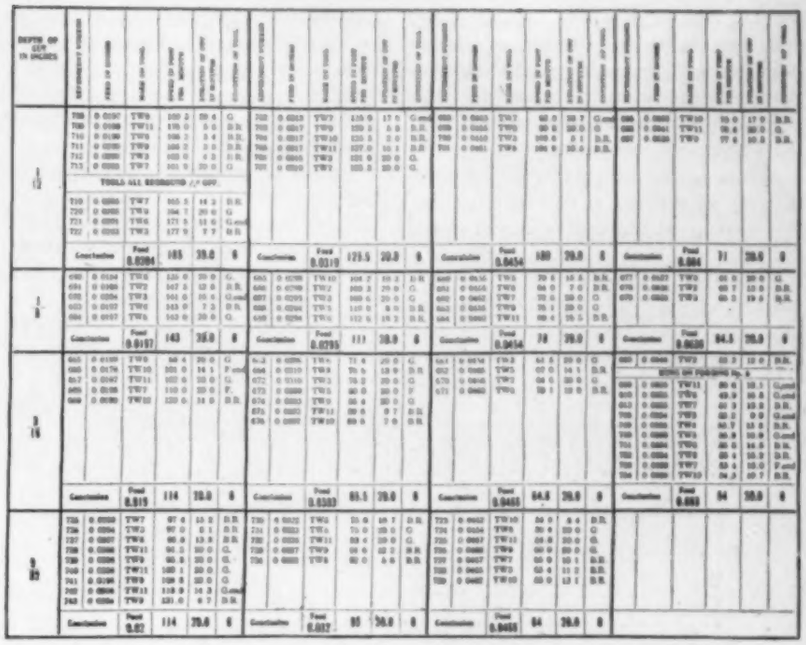


FIG. 12.—EFFECT ON CUTTING SPEED OF VARYING DEPTH OF CUT AND FEED IN CUTTING STEEL.

This represents one of the poorest of any set of experiments from which conclusions were drawn.

FEED 1/16" DEPTH OF CUT 1/4" 1/4" STANDARD ROUND NOSE TOOL. CLEARANCE ANGLE 6°, BACK SLOPE 8°, SIDE SLOPE 14°. SEE FOLIOS 8, FIG. 34

| 10 MINUTE RUNS | | | | | 20 MINUTE RUNS | | | | | 40 MINUTE RUNS | | | | | 80 MINUTE RUNS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXPERIMENT NUMBER | MAKE OF TOOL | SPEED IN FEET | DEFLECTION OF CUT | CONDITION OF TOOL | EXPERIMENT NUMBER | MAKE OF TOOL | SPEED IN FEET | DEFLECTION OF CUT | CONDITION OF TOOL | EXPERIMENT NUMBER | MAKE OF TOOL | SPEED IN FEET | DEFLECTION OF CUT | CONDITION OF TOOL | EXPERIMENT NUMBER | MAKE OF TOOL | SPEED IN FEET | DEFLECTION OF CUT | CONDITION OF TOOL |
| 14834 | 73PRL | 88 8 | 10 0 | G* | 14858 | 2709ME | 60 5 | 20 0 | G | 14865 | 106PRL | 50 0 | 40 0 | G | 14868 | 1943ME | 46 75 | 40 0 | B |
| 14836 | C1939ME | 89 6 | 10 0 | G | 14859 | 106PRL | 61 5 | 20 0 | G | 14866 | 126PRL | 52 0 | 40 0 | G | 14881 | C2709ME | 51 5 | 80 0 | G |
| 14837 | C1903ME | 62 2 | 10 0 | G | 14860 | 170PRL | 60 2 | 20 0 | G | 14867 | 102PRL | 50 4 | 32 7 | B | 14883 | C2099ME | 49 9 | 80 0 | G |
| 14838 | C2665ME | 66 7 | 10 0 | G | 14861 | 106PRL | 60 5 | 20 0 | G | 14869 | 116PRL | 52 0 | 40 0 | G | 14935 | C2787ME | 53 5 | 80 0 | G |
| 14839 | C2721ME | 66 4 | 10 0 | G | 14862 | C1945ME | 61 0 | 30 0 | G | 14872 | C1945ME | 52 5 | 40 0 | G | 14936 | 126PRL | 52 6 | 46 5 | B |
| 14840 | C2709ME | 71 1 | 10 0 | G | 14863 | 2709ME | 63 4 | 9 0 | B | 14877 | 105PRL | 50 3 | 40 0 | G | | | | | |
| 14841 | C1939ME | 73 5 | 4 0 | B | 14864 | 170PRL | 62 5 | 10 1 | B | 14878 | 125PRL | 50.75 | 40 0 | G | | | | | |
| 14842 | C1903ME | 70 0 | 5 5 | B | | | | | | 14880 | 106PRL | 50 2 | 14 4 | B | | | | | |
| 14843 | C2721ME | 70 0 | 3 5 | B | | | | | | 14880 | 115PRL | 50.25 | 40 0 | G | | | | | |
| 14844 | C2665ME | 67 5 | 1 8 | B | | | | | | 14886 | 108PRL | 50.5 | 12 1 | B | | | | | |
| 14845 | C2709ME | 70 0 | 2 0 | B | | | | | | 14887 | C1945ME | 50 2 | 40 0 | G | | | | | |
| Conclusion | | 87 | 10 | 0 | Conclusion | | 62 | 20 | 6 | Conclusion | | 50.5 | 40 | 0 | Conclusion | | 51.5 | 80 | 6 |
| CUTTING SPEED FIGURED BY THE FORMULA $V = \frac{90}{T}$ | | | | | | | | | | | | | | | | | | | |
| 87.5 | | | | | 61.9 | | | | | 50.7 | | | | | 52 | | | | |

TABLE 13.—EFFECT ON CUTTING SPEED OF TIME TOOL IS UNDER CUT IN CUTTING STEEL.

without the danger of overheating; and also, in spite of the work being done on an automatic grinder, this inspector should examine each tool with templets and gages to be certain that the curves and angles are right.

Before using a tool, the operator himself should see to it that the bottom surface of the tool is a true plane, and that the tool is supported by the tool post as far forward as practicable (in fact, almost directly under the cutting edge), thus eliminating one possible element of vibration or chatter. In many cases we have, therefore found it advantageous to grind the bottom of our experimental tools to a true plane on a surface grinder.

After all of these precautions have been taken, it is then necessary to accurately determine the standard speed at which this make of tool will be ruined at the end of a 20-minute run, and if for example, it has been shown that the standard ruining speed of these tools is 61 feet per minute when run upon a forging which has been previously proved to consist of uniform metal, then each of the tools before being used in experimenting should be successively run upon the same forging at a speed of 60 feet for a period of 20 minutes without ruining.

### Where Practicable in Experimenting no Cuts Lighter than 3-16 Inch Depth by 1-16 Inch Feed Should be Taken.

In determining many of the laws connected with this art it is possible for the experimenter to choose the size of the cut to be used in his trials, and we should recommend for all experiments of this character the use of a cut 3-16 of an inch in depth by 1-16 of an inch feed. If a heavier cut than this be taken, too much of the test piece (either forging or casting) will be used up, and there is likely to be difficulty in obtaining sufficient test metal of uniform quality to complete a full set of experiments. On the other hand, with a depth less than 3-16 of an inch, the error that is likely to be made even by the best experimenters in maintaining a uniform depth of cut, becomes such a large percentage of the total depth as to materially affect the acurracy of the experiment. This is true to such an extent that as a result of our experience we should consider practically worthless for determining laws all cuts that are as shallow as 1-16 of an inch, and we should much prefer a 3-16 inch depth to a ⅛ inch depth.

A feed which is finer than 1-16 of an inch is also undesirable for experiments because any trifling imperfection or flaw at or near the cutting edge of the tool will more seriously affect the results with a smaller feed than this, and also small hard spots or other blemishes in the metal that is being tested have a much worse effect upon the tools with fine than with coarse feeds.

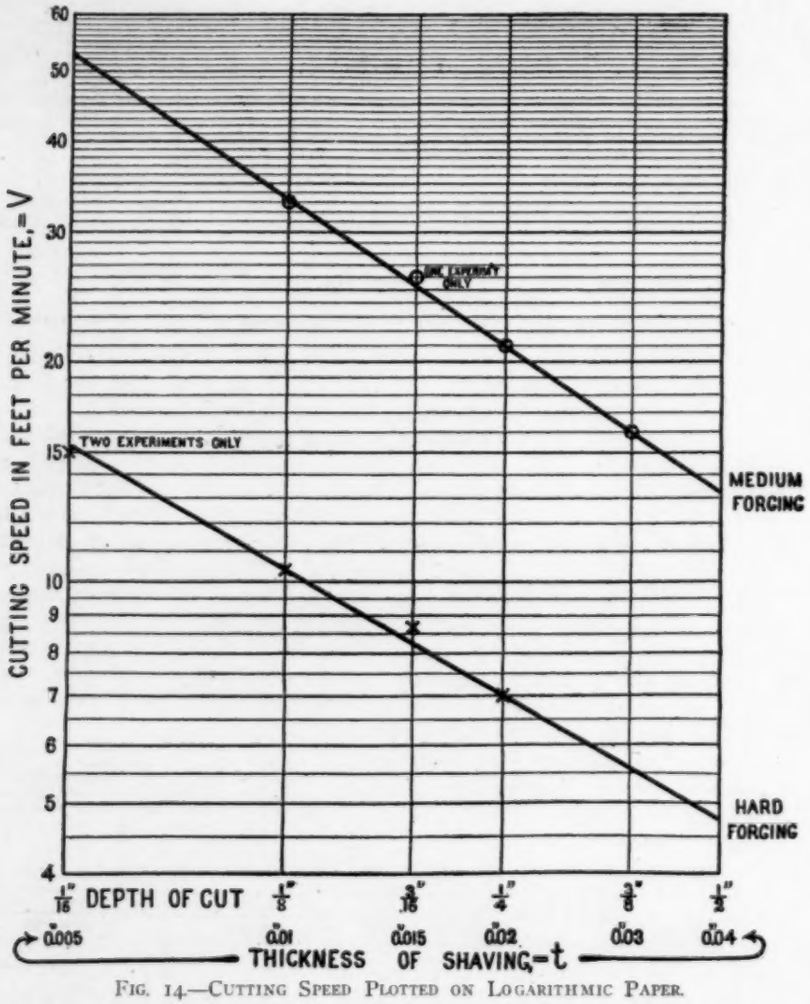



FIG. 14.—CUTTING SPEED PLOTTED ON LOGARITHMIC PAPER.

Upper straight line represents formula $V=1.54\div t^{\frac{2}{3}}$ for hard forging.
Lower straight line represents formula $V=1.54\div t^{\frac{2}{1.6}}$ for medium forging.

### More Time Required in Preparation Than in Experimenting.

From all this it is evident that the time and trouble required in preparing for a set of experiments is far greater than that of actually doing the work; and this should emphasize the necessity for great care in every detail both of making the experiments and in accurately observing and recording every item which may have any bearing upon the final result.

Let me again repeat, then, that the art of making these experiments consist mainly in holding constant and uniform all the various elements affecting the problem, while the one element which is being studied is varied.

We have been fully alive for some seven or eight years past to the necessity for all these precautions, and the writer believes himself to be justified in saying that no care has been spared in doing our work. Yet in critically examining the results of even our more recent sets of experiments, it becomes apparent that for one cause or another, perhaps more than one-half of the results obtained were such that we should not be willing to accept them as true indications of the laws which we were investigating; and in most of these cases of what may be called partial failure we have not been able to definitely locate the cause. At times it was probably due to a slight irregularity in the composition of the tool steel, or perhaps to a brittleness at the cutting edge of some of the tools which did not show in our preliminary tests of the tools, and in other cases to occasional zones or

spots in the experimental forging which were harder than the rest, or to an undetected variation in the rate of the cutting speed; all of which merely emphasizes the necessity for taking infinite pains in this work.

**Operator's Daily Record.**

Fig. 10 is given as a sample of one of our sheets, upon which were entered by the operator the details of the experiments made at the lathe. It may be remarked that no possible harm is done by recording too many items even remotely affecting each test, while the omission of what may at the time seem a matter of no moment may ultimately prove of most serious import. The writer has particularly in mind the fact that in some of his early experiments he failed to either date his experimental sheets or to number consecutively his experiments. Owing to this omission he was obliged later on to throw away all of the results obtained because he was unable to distinguish between the records of a certain set of experiments which he knew to have been accurately made, and another set in which he discovered, after making, a serious error in method.

**Summary Sheet.**

The table, Fig. 11, is a sample of one of our summary sheets, upon which have been recorded the runs of one of our best series of experiments for the purpose of determining the effect of feed and depth of cut in cutting steel with a round nosed tool.

The table, Fig. 12 is a sample of one of our summary sheets, upon which has been recorded another set of experiments for the purpose of determining the laws of feed and depth of cut in cutting steel with a round nosed tool. This set of experiments represents a case in which we have made a partial failure in our work. In fact, it represents one of the poorest of any of our sets of experiments from which we have attempted to draw conclusions. By examining the standard speeds of the tools under the column marked 9-32-inch depth of cut, it will be observed that the standard speeds in this column are approximately the same as those given for the 3-16-inch depth of cut. Now, our knowledge of the art teaches us that without question the true cutting speed for a 9-32-inch depth of cut should be materially slower than that for a 3-16-inch depth of cut. It follows, therefore, that we have failed at some point in making these experiments. In this particular case the failure may have been due either to irregularity in the standard tools, or more probably to a change in the hardness of the forging operated upon, as we approached its central zone.

Fig. 13 is a sample of one of our summary sheets, upon which has been recorded a set of experiments for the purpose of determining the effect of the duration of the cut upon the standard cutting speed, cuts of 10, 20, 40, and 80 minutes' duration each being experimented with. This set of experiments likewise belongs to the class of those which show a certain amount of irregularity, either in the forging, the tools, or in our methods.

**Each Law and Diagram the Result of Several Series of Experiments.**

In finally determining and formulating what we believe to be the true laws, no one set of experiments was found to be sufficient. In almost all cases the results obtained by two or more sets of experiments were plotted together upon logarithmic paper, and by inspecting the lines drawn through the points located upon this logarithmic paper, the results of several sets of experiments can be co-ordinated, and the general trend of the law much better indicated than would be possible from any one set of experiments alone. A mathematical expression is then found which corresponds to the line which approximates most closely to the law, as indicated by thus combining several experiments. For a sample of this use of a logarithmic sheet, see Fig. 14.

In Fig. 15 will be again seen a sample of the actual curve corresponding to one of these mathematical expressions, and each of the spots located at various places close to the line of this curve represents the summary or conclusion arrived at as the result of a large number of experiments. An inspection of these curves will indicate the extent to which we have succeeded in a mathematical representation of the laws.

The matters will be discussed more fully later in the paper, our object in anticipating being to give at this point a birdseye view, as it were, of a number of the steps taken toward finally making daily use of our experiments through the slide rules.

(To be continued.)

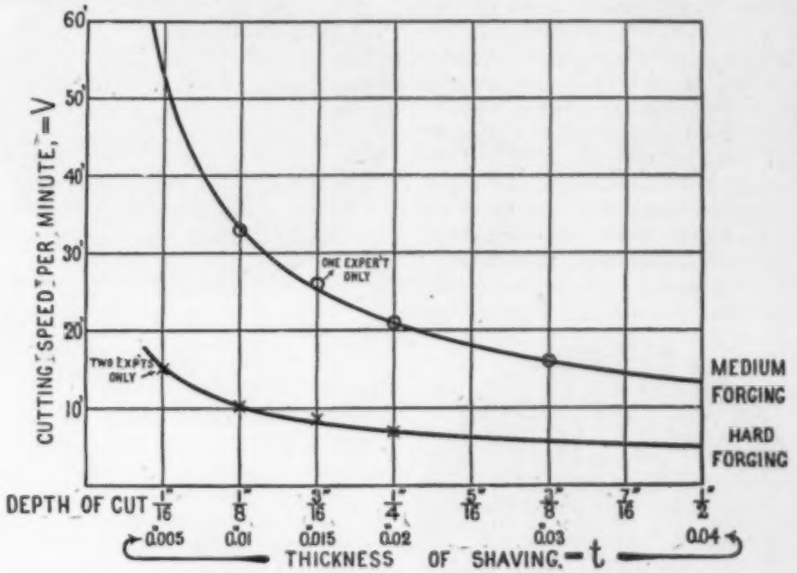



FIG. 15.—CUTTING SPEED PLOTTED ON CROSS SECTION PAPER.

Upper line represents formula $V=1.54 \div t^{\frac{3}{4}}$ for hard forging.

Lower line represents formula $V=1.54 \div t^{\frac{2}{3}}$ for medium forging.

## MILWAUKEE INDUSTRIES.

Milwaukee, Wis., Jan. 15.—The Milwaukee Metal Trades and Founders' association will have its annual election of officers, followed by a banquet, at the Plankinton house, Jan. 18. There will be papers and talks by prominent men and members of the organization, and music.

The Nordberg Mfg. Co. is having plans drafted for a foundry 400 x 240 feet in size, adjoining its plant in the town of Lake.

Anton Gutkowski, whose sentence had not been pronounced at the time of the sentencing of six others found to have violated the Allis-Chalmers injunction against striking molders, has been sent to jail for sixty days by Judge A. L. Sanborn. Sentence was suspended upon the remaining man. Gutkowski's sentence is the heaviest inflicted upon any

The December industrial review of Milwaukee's activities shows the value of all metal products for the preceding twelve months to have been $95,444,000.

## OPEN-HEARTH STEEL CASTINGS.—XII.[1]

By W. M. Carr.

### Heat Treatment and Structure.

The ranges of ductility and tensile strength seemingly vary with temperature and rate of cooling. The treatment that will give the maximum degree of elasticity combined with the maximum degree of ductility is the one that should be aimed at in high grade product.

The strength or elasticity depends upon the amount of carbon present and the form that it assumes as a result of the heat treatment it may receive.

Ductility depends upon the smallest possible degree of refinement or non-crystalline formation structurally that the carbon-iron alloy is capable of assuming. These refinements control the annealing or heat-treatment methods and satisfactory results cannot be obtained in practice without an observance of the laws governing them. The process can best be studied with the aid of a microscope. Photomicrograph Fig. 1 is a view showing the structure of 0.25 carbon cast steel magnified 190 times. Fig. 2 shows the same steel heated to 1,200 degrees and cooled slowly in the furnace. Fig. 3 is the same steel heated to 1,200 degrees and air cooled. In Fig. 4 it was heated to 825 degrees and air cooled. All photomicrographs are magnified the same, and a study of the various formations in conjunction with the physical properties as tabulated will show plainly what is accomplished in cast steel by heating and cooling differently. Figs. 1. 2 and 3 are all coarse and more or less brittle. Fig. 4 shows the refinement obtained at "W"[2] and with it will be found physically a great improvement in ductility. In each case the composition is precisely the same since each specimen was cut from one bar of steel.

Fig. 1.—Specimen of Cast Steel in Condition as Cast. (Air Cooled.)

Some attention will now be given to the constituents recognized microscopically in steel.

Fig. 2.—Same Steel Heated to 1,200° Cent. (2,192° Fahr.) and Cooled Slowly in the Foundry.

First in order comes "Ferrite" which may be seen in the submitted photomicrographs by the white areas. It is nearly pure iron, that is, carbonless (plus Si, S, P, and Mn.). It is soft, weak and ductile.

Next in importance is "Cementite" and which is not free or visible separately in ordinary cast steel. It is the carbon iron alloy and is expressed definitely as $Fe_3C$. It is that constituent which confers hardness, elasticity and strength upon steel.

Finally there is "Pearlite" which is distinguished from "Ferrite" by the dark areas shown in the photographs.

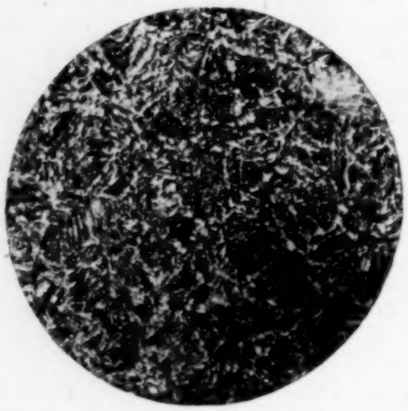


Fig. 3.—Same Steel Heated to 1,200° Cent. (2,192° Fahr.) and Air Quenched.

It is a mixture or combination of "Cementite" and "Ferrite" in the proportions of 1 to 6. The constituents as named are the only ones that enter in the problems of annealing cast steel. (There are others, such as Martensite, Troosite, etc., which are only found in steels that may be hardened and tempered.) Cementite is not structurally free until the carbon exceeds 0.9 per cent. Pearlite is recognized as existing in three forms. In photomicrograph Fig. 1 it is called "lamellar" and is always found in steel slowly cooled from a high temperature (in this case from casting temperature of nearly 1,600 degrees). Fig. 2 indicates also cooling but from a lower temperature. The structure is still "lamellar" but not distinctly so. Fig. 3, cooled at a quicker rate (air quenching) but from the same temperature as Fig. 2 is called "sorbitic" pearlite. The physical properties accompanying such a structure would be slightly stiffer than in Fig. 2 with about the same ductility. In Fig. 1 the ductility is low but with a higher tensile strength than Figs. 2 and 3. Fig. 4 gives a view of "granular" pearlite and is the one sought when ductility and resistance to shock is necessary. The tensile strength with such a structure is slightly lower than those of the preceding. In the last structure we have a view of the marked change that has occurred by a heating to "W"[2] when the previous structure was as shown in Fig. 1 and also what occurs in grain growth in the other photographs when the temperature is carried far above "W." Were the temperature increased to or about 1,500 degrees there would have been in Figs. 2, 3 and 4 about the same formation as in Fig. 1.

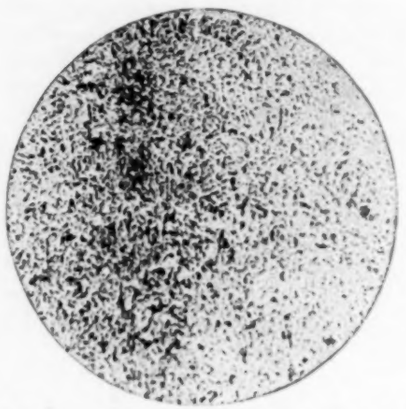


Fig. 4.—Same Steel Heated to 800° Cent. (1,472° Fahr.) and Cooled in Air. An Ideal Structure for Steel Castings.

A study of Fig. 1 reveals a reason why cast steel unannealed is more or less brittle and snaps or fails suddenly on shock or impact. The dark areas or the carbon compound is comparatively hard, while the light or

[1]This is the last article of Mr. Carr's series on open-hearth castings.

[2]The Iron Trade Review, Dec. 13, 1906, page 23, Fig. 1.

carbonless areas are weak and there is an uneven distribution of the strong and weak parts so that the ferrite areas offer planes of cleavage under stress.

When the structure is broken up as in Fig. 4, the crystals are very small with an even intermingling of the several constituents with cleavage planes practically reduced to nil. A fracture occuring in cast-steel with a coarse structure always follows the ferrite areas and it is not known that the line of separation passes through the pearlite. A coarse microstructure usually accompanies a coarse fracture while a fine microstructure will show a fine, silky fracture.

In order to study the structures microscopically means a careful preparation of the specimens and a high powered instrument with several necessary appurtenances.

**Thermit Repairs in Steel Castings.**

Since the advent of chemistry in foundry practice there is no metallurgical invention that has proved so useful as the thermit process as perfected by Dr. Hans Goldschmidt. Its flexibility and simplicity appeal strongly to the steel foundrymen for supplying liquid steel in almost any quantity quickly and at any time. The process has been too well promulgated in the technical press to need any explanation here as to its composition and action. Rather the remarks herein will relate to the methods of applying it in the practice of making repairs of the defects common to steel castings. The consideration from the foundry standpoint is mainly appearance and in this regard thermit is superior to all means, in the writer's knowledge and experience, of remedying unsightly flaws which can cause rejection without depreciating the strength.

Whether a casting should or should not be repaired with thermit will depend upon the cost of the operation. If that should exceed the molding cost, it will be cheaper to re-melt it, because the casting will always have a credit value on the basis of the market price of scrap and the loss because of the flaw will only represent the labor in molding and handling. The question of delivery frequently offsets other considerations.

Many castings are of such a size that they can be readily repaired in blacksmith's fire at a nominal cost for fuel and labor. Thermit is extremely useful in heavy, valuable castings. The commonest flaws in them are shrink-holes under-headers, sand-holes, miss-runs and cracks.

If the defect is a shrink-hole or sand-hole and where there is no machined surface, the method of filling is quite simple. There may be some grease or oil in the hole which must be removed before it can be welded. It is not always possible to pre-heat or burn out, because the operation is slow and tedious, particularly in the case of large castings, and there may not be a large torch or oil burner convenient. The simplest way to remove the grease is to pour into the hole some loose thermit, ignite it and allow the heat of the reaction to burn out the oil, grease and dirt, which it will do most effectively. There will be a violent sputtering in the hole and a mass of slag and spongy metal. The slag can be chipped out readily. The hole is then ready for the final treatment. A gate-pin can be secured which must be larger in diameter by at least 1 inch than the hole. It should be placed over it in an upright position, and some green molding sand packed around it. Withdrawing the pin leaves a mold into which the thermit can be placed. The depth of the mold should be at least 2½ inches. When the thermit is ignited, and while burning, some loose thermit should be poured upon it for the reason that the mold will not hold in the first instance enough thermit to completely fill the hole. As soon as the action has ceased and the slag solidified the mold can be broken away together with the mass of slag. The button of metal will be white hot and as soon as it reaches a yellow or bright red it can be forged by a hand hammer. This treatment will effectively and cheaply fill any hole of the character described on surfaces that will not require machining. The button of metal will protude more or less, but it can be ground down or chipped, preferably ground.

In case such defects as just mentioned are on surfaces that may require machining, a different procedure is necessary because blow-holes must be absent from such surfaces. The same method of removing grease and dirt can be followed as in the foregoing paragraph and a charcoal or coke fire can be built over the flaw. Sand must be removed by chipping to expose clean metal. The mold must be dry sand. It can be made from a slab-core by cutting a recess or hole in it with a file. The mold must be as large in diameter inside in excess of diameter of the flaw, as in the previously described method. The mold must be carefully placed over the flaw, weighed down and the joints daubed with moist clay or dough and backed by green sand. A thermit crucible is then placed directly over the mold, charged, ignited and tapped in the usual manner. It is not recommended in this case to attempt to forge or hammer the button while hot. Let the parts cool down normally. Afterwards grind the button down flush. Grinding is better than tooling because the button, if the proper quantity of thermit has been used, will stand up some distance when the casting is placed upon a planer, the leverage of the tool is too great and there is danger of taking too heavy a cut, thus tearing the soft thermit metal out. Because of its softness it gathers under or crowds the tool and also prevents or interferes with free cutting, increases the resistance and danger of tearing. A light cut can be taken and when the button decreases in size, of course the leverage decreases, too. Should the metal be porous from any cause, or should the weld be imperfect because of an insufficiency of thermit in the first instance for welding, the operation can be repeated since thermit metal welds beautifully to the same metal and a second treatment usually satisfactorily finishes the job.

In case of shrinkage cracks, the metal must be cut away along the line of the opening to the extent of at least ½ inch or more. A mold of core material must be rammed on the casting to get the contour of the parts, allowing a mold space to form a band overlapping the edges of the opening at least ½ inch on each side of it and from ¾ to 1 inch in thickness. In welding such flaws the incoming thermit metal must enter the mold at the lowest point and overflow at the highest, using enough to get a good circulation. When cool the band of metal can be removed to the finished surface.

No fixed rule can be laid down as to the quantity of thermit to use. Usually there are no scales in the cleaning room of a steel foundry, and the operator must use his own judgment how much to use for a given operation. Practice alone will govern and there is always the satisfaction of knowing that if a weld be imperfect from any cause it can be repeated.

All foundrymen are familiar with the well known "burning-on" of metal. Thermit practice is essentially in many details the same operation with the advantage that a "burn" can be made at any convenient time if the compound is available. The same rules will apply as in burning-on excepting that allowance must be made for a voluminous slag which always accompanies an action of thermit.

The operation of "burning-on" by ordinary liquid steel can be augmented by adding thermit to the ladle of steel taken for the purpose. An addition of 5 per cent by weight will greatly increase the temperature of the steel and of course make the operation sure because of the gain in heat.

## VERY HIGH PRICES

### And Increased Production of Copper, Lead and Spelter During the Past Year.

The copper output in the United States during 1906 showed gains over the year preceding in every producing state save three, Colorado, Montana and Wyoming. Figures compiled in detail by the *Engineering and Mining Journal* give a total production in pounds during 1906 of 915,000,000, as compared with 817,715,005 in 1904 and 871,634,245. Labor shortages and limited smelting capacity were largely responsible where the production fell short of expectations for the year. Enlarged and new plants already being developed promise a remedy for the latter difficulty in 1907.

The same authority, estimating the consumption of copper in the United States during 1906, finds it to have been in 1906, 660,540,00 pounds, and in 1905, 612,983,199 pounds.

From the market standpoint the important consideration has been the growth of consumption with relation to the available supply of copper.

The market price, responding to this condition at the close of 1906, reached the highest point since 1880 when copper sold at 23 and 24 cents. The average prices of copper during the year just ended are given as follows:

New York, electrolytic, 1905, 15.590; 1906, 19.278. Lake, 1905, 15.699; 1906, 19.533. London, 1905, 69.465; 1906, 87.282.

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 pound, standard copper.

Of the other metals the production of lead was increased in 1906 from 405,978 short tons in 1905 to 412,042 tons. For reasons identical with those affecting the copper market, prices in lead ruled higher this year than in 30 years past, as shown by the average New York market prices during the year—5.347 cents per pound.

Spelter was produced in increased quantity during the year, the total reaching 225,395 tons, while the market remained practically constant throughout the twelve months at an unusually high price shown by the following average figures:

New York, 1905, 5.822; 1906, 6.198. St. Louis, 1905, 5.730; 1906, 6.048. London, 1905, 25.433; 1906, 27.020.

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 pound) good ordinary brands.

The mining of tin in this country continues to be a small industry, even less being produced than in 1905. The total production in the world amounts to but 94,000 long tons, of which the United States produced about 11.45 per cent and consumed 47.3 per cent. The average price at New York was 31.358 cents per pound in 1905 and 39.819 cents in 1906.

## A GRAVITY MOLDING MACHINE.

A molding machine which is unique in that it packs the sand in the flask by gravity instead of by a pneumatic or mechanical ramming is being placed on the market by the Mitchell-Parks Mfg. Co., St. Louis. The machine complete is illustrated in Fig. 1. It comprises essentially two chain belts suspended from a pair of sprocket wheels located about 15 feet above the floor level. These chains carry buckets which descend into a boot below the floor and are there

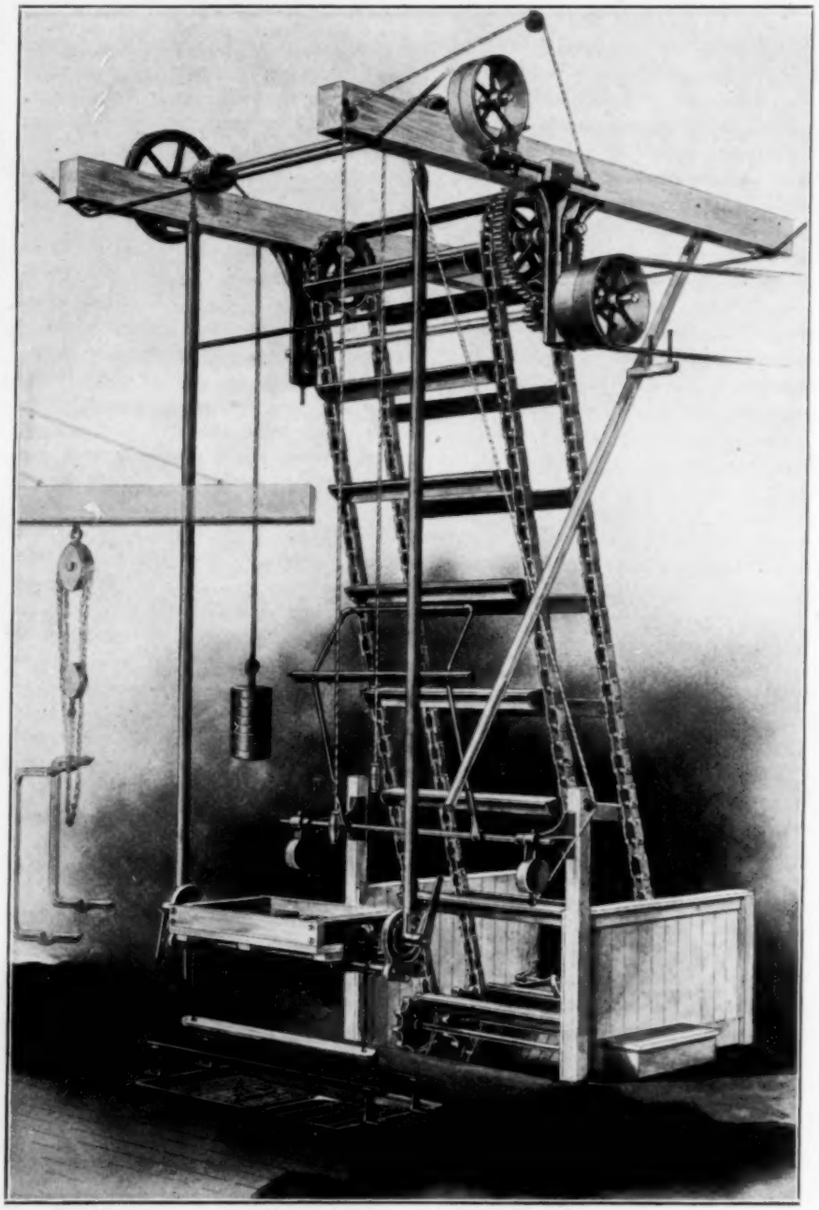


FIG. 1.—THE GRAVITY MOLDING MACHINE.

loaded with sand. The sand is then elevated, being compressed in the buckets by an automatic rammer during its ascent and dropped a distance of about 12 feet from the top of the elevator to the flasks. The details of the machine are shown in the line drawings, Figs. 2 and 3. As will be noted, the flask is carried on a swinging cradle suspended from the same beams carrying the sprocket wheels shaft. This cradle can be rocked back and forth, in order to insure an even distribution of the sand as it falls from the elevator. It is also capable of being raised and lowered in order to discharge the completed mold. Directly below the floor underneath the flask, is a hopper covered over with a shaking riddle. Sand is shoveled into this riddle, and thence discharged into the hopper, from whence it is fed to the elevator buckets by a feed roll. As each bucket passes the floor level, it comes in contact with an automatic rammer, which compresses the sand in each bucket, so that it will not disintegrate in falling, but will descend in a solid mass of sufficient body to pack firmly around the pattern and to also ram the sand below it. These bodies of sand are thrown from the elevator buckets as they turn over the head sprockets.

When the flask has been filled, a strike-off, shown in the illustration, is drawn down into position and scrapes the sand off even with the edge of the flask. The flask is then fastened firmly to the cradle by means of the clamp shown, and turned upside down and the cradle lowered, the flask being deposited upon the supporting rails directly under the cradle.

Each half of the pattern is attached to a match-board fastened to the cradle. After the flask has been deposited on the supporting rails, the cradle is drawn vertically upwards, thus withdrawing the pattern from the mold. The cradle is then raised to its working position, another flask is placed on it, and the operation repeated.

The machine is installed in the center of a floor space large enough to contain the entire output of the machine for one day. This floor space is served by means of two jib cranes situated as shown in the plan view Fig. 4. Two laborers and one operator are usually required for the machine; the laborers to shovel the sand into the hopper, to bring flasks to the machine and to remove the completed mold. The sand should be tempered at night and arranged in piles on each side of the machine.

For making copes, special bails are used on the cranes, as shown in the illustration, Fig. 1, by means of which the flask can be turned and placed in position on top of the drag. Bottom-boards are clamped on the drags before they are turned in the cradle and are carried away from the machine with the flask for the purpose of supporting the sand. The cope flasks have special bars which hold the sand in place without the use of bottom-boards.

The machine is built in a varying number of sizes, ranging in capacity from a flask 22 x 30 inches up to 48 x 64 inches, and will handle any ordinary depth of flask not exceeding 18 inches. The space occupied by the different sizes of machines is the same in all dimensions, excepting width, all sizes being about 15 feet from the top of the elevator to the floor. The distance which

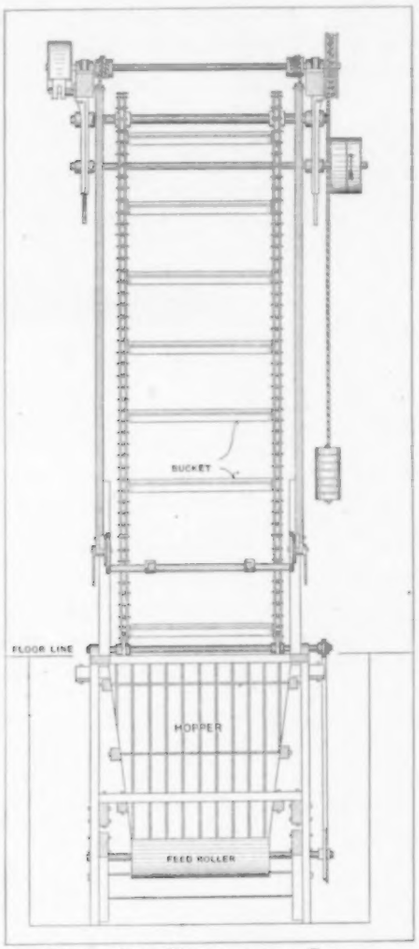



FIG. 2.—END ELEVATION OF GRAVITY MOLDING MACHINE.

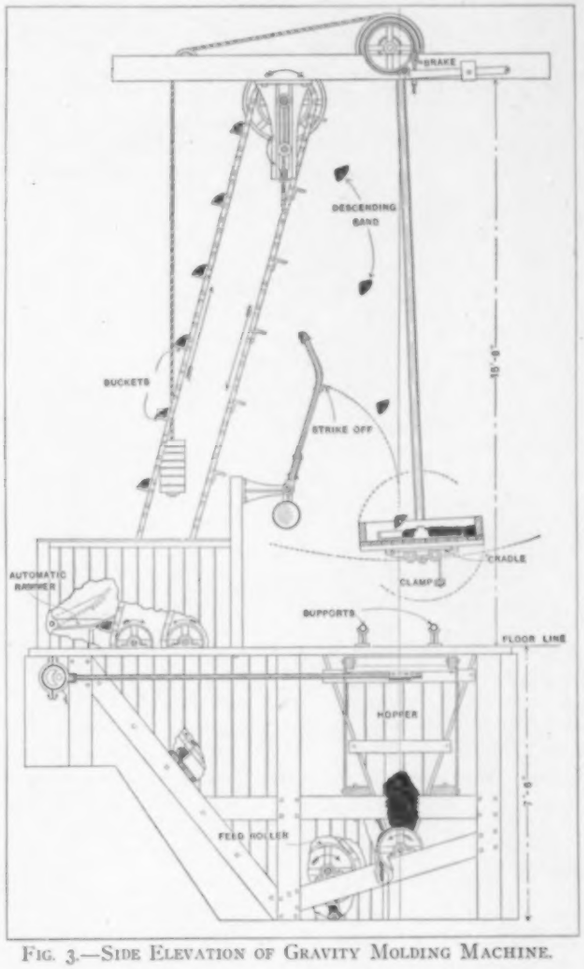



FIG. 3.—SIDE ELEVATION OF GRAVITY MOLDING MACHINE.

the sand falls from the top of the elevator to the flasks in all cases is 12 feet. The firmness of the molds is regulated by adjusting the automatic compressor, and by increasing or decreasing the tension on it, so as to pack the sand in the buckets with greater or less firmness. It is stated that the pressure of the rammer can be adjusted so as to pack the molds much harder than they are ordinarily rammed up by hand. It is also claimed that one unskilled workman can operate this machine with but little practice, and that its capacity is equal to about eight hand molders. The lumps of sand drop from the buckets into the flask at the rate of over 50 a minute, thus filling a large size flask in a very short time. No stripping plates are required, and the machine can be rapidly changed from one pattern to another.

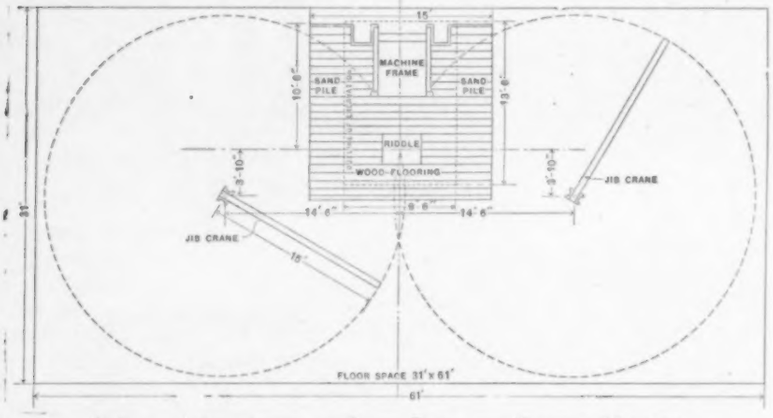



FIG. 4.—ARRANGEMENT OF FLOOR SPACE FOR GRAVITY MOLDING MACHINE.

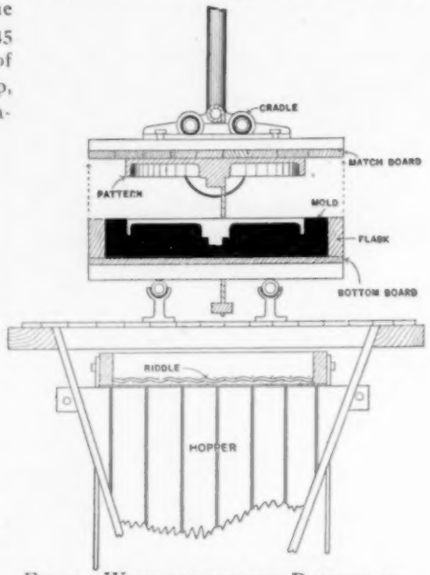



FIG. 5.—WITHDRAWING THE PATTERN ON GRAVITY MOLDING MACHINE.

## CANTON PLANT STARTS.

The Republic Stamping & Enameling Co., Canton, O., of which H. C. Milligan is president and general manager, manufactured its first ware Jan. 2 according to schedule. The new plant for which the foundations were begun in August, embodies the most advanced features of design and equipment and is expected to be unique in its facilities for handling its class of work rapidly and economically. At present there are but two general departments, stamping and enameling. Raw material is received as sheets, consisting of 4,000 tons of open-hearth steel annually. However when completed the factory will include a rolling mill of ample size to roll all of the plant's requirements. The company is prepared to handle business for 1907 up to its capacity and already has large contracts booked.

## SIX MILLION TONS

### Will be Carried in a Season by Forty-five Freighters Ordered for This Year's Delivery.

Forty-five bulk freighters are in course of construction for 1907 delivery in the ship yards of the great lakes. Thirty of these are being built by the American Ship Building Co., nine by the Great Lakes Engineering Works, three by the Toledo Ship Building Co., two by the Collingwood Ship Building Co., and one by the Canadian Ship Building Co. These 45 freighters have a carrying capacity of 302,000 gross tons on a single trip, or 6,040,000 tons in an average season of 20 trips. A tendency to return to a medium sized carier is indicated by the construction. The average carrying capacity of the 1907 ship building program is reduced by the fact that there are 15 steamers building with carrying capacities between 6,500 and 7,000 tons. The new factor in the ship owning field among the steel-making companies is the Lackawanna Steamship Co., of Buffalo, the lake end of the Lackawanna Steel Co. This company is having built eight ships, six of 7,000 tons and two of 8,000 tons capacity. The largest sized carriers continue to be popular with the United States Steel Corporation. The Pittsburg Steamship Co., the lake end of the United States Steel Corporation, has placed orders for four 600-footers, which will give the corporation a fleet of 12 of the largest sized carriers on the lakes, eight 600-footers and four 569-footers. The distinction of operating the largest carriers on the lakes, however, will go to the Tonawanda Iron & Steel Co., as the three steamers building for the Weston Transit Co. are to be 605 feet long. The United States Steel Corporation, the Jones & Laughlin Steel Co., the Cambria Steel Co., the Lackawanna Steel Co. and the Tonawanda Iron & Steel Co. are the steel-making concerns that now have fleets on the lakes.

**Will Build Two Furnaces.**—At the meeting of stockholders of the Youngstown Sheet & Tube Co., of Youngstown, O., Jan. 10, it was voted to increase the capital stock of the corporation from $4,000,000 to $6,000,000. The stockholders further recommended to the board of directors that two modern blast furnaces be erected and the fixing of the sum required for the improvement is left to the discretion of the latter body. The purpose of the increase in the capital stock is to cover the erection of two stacks to furnish pig metal to the new steel mill completed last summer. When they are completed a new belt line will be constructed, connecting them with the Lowellville furnace. The improvements will give the steel mill the product of four large furnaces.

The Canadian Foundry Co., of Toronto, is to engage extensively in the construction of Bucyrus steam shovels weighing 90 tons each, which have hitherto been imported from the United States. Large contracts have been placed with the company by the Canadian Pacific and Canadian Northern railways.

The Wilmington Iron Co., of Wilmington, Del., has announced an increase of 20 cents a ton in the pay of its employes.

# Prosperity Confuses the Stock Market.

A rather confusing situation is apparent in the field of stock transactions after two weeks of 1907 have passed. While the money situation is favorable to an active market, the great prosperity among the industrial interests and their constant demand for increased capitalization have tended to complicate the otherwise good conditions. This need and desire for increased capital was reflected during the week by the action of the Pennsylvania railroad in asking for a further increase of $100,000,000 in stock and $100,000,000 in bonds. The rather unsettled outlook is due primarily to excessive prosperity. The many industrial concerns have booked orders insuring their great activity for the next six months at least. Generally the demand is greater than the supply. Arrayed opposite each other in this situation of doubt is the optimism in the ability of the country to take care of the future as against an unsettled state of mind caused by the general demands for added capitalization into which a doubt as to the political situation in the presidential campaign of 1908 also enters. The money situation is generally improved. Time money during the week did not get above the 6 per cent level. Call money rates were stiff the first half of the week, falling however on Thursday to a comparatively low point. The announcement of Secretary Shaw in postponing the withdrawal of government deposits in national banks was probably the effective force in bringing this about. The bank statement was favorable. The market of the week was affected largely by the developments in the various corporations, and generally there was a slight sagging which recovered to a great extent on Saturday. The average price of 20 railroad stocks declined about three points. The total stock transactions of the week in the New York exchange were 1,922,400 shares, as compared with 2,368,400 shares last week and 8,791,600 shares the corresponding week in 1906. Cambria Steel continued its rise and netted 3½ points during the week. Bethlehem Steel preferred showed a rise of 5 points and Westinghouse Air Brake gained 3½ points.

**THE LEADING INDUSTRIAL SECURITIES.**

| | Closing Quo. Jan. 12 | Changes In Week | Date 1907 Ann. Meet. | Stock Outstanding | Dividend Basis | Dividend Being Paid | Dividend Date Last Div. Pay. |
|---|---|---|---|---|---|---|---|
| Allis-Chalmers | 16 | − ¾ | Sept. 5 | 19,820,000 | | ..... | ..... |
| Allis-Chalmers pr | 42½ | + ¾ | | 16,150,000 | 7 cum | ..... | Feb., 1904 |
| American Can | 6 | + ⅛ | Feb. 5 | 41,233,300 | | ..... | ..... |
| Am. Can pr | 54½ | + ½ | | 41,233,300 | 7 cum | 5 Q. | Jan., 1907 |
| Am. Car and Fdy | 44⅜ | − ⅜ | June 27 | 30,000,000 | | ½ Q. | Jan., 1907 |
| Am. Car and Fdy pr | 103 | +1½ | | 30,000,000 | 7 n. c. | 7 Q. | Jan., 1907 |
| American Loc | 74¼ | + ¼ | Oct. 5 | 25,000,000 | | 1¾ | Feb., 1907 |
| American Loc. pr | 110 | + ½ | | 24,100,000 | 7 cum | 7 Q. | Jan., 1907 |
| American Ship | 79¾ | +3 | Oct. 2 | 7,600,000 | 6 | 1 Q. | Dec. 1906 |
| American Ship. pr | 110 | +1 | | 7,900,000 | 7 n. c. | 1¾ Q. | Jan. 1907 |
| Am. Steel Foundries | 105½ | ..... | Oct. 1 | 15 810,000 | | ..... | ..... |
| Am. Steel Foundries pr | 46 | −1 | | 17,240,000 | 6 cum | ..... | Aug., 1904 |
| Barney & Smith | 70 | ..... | June 4 | 2,000,000 | 4 | 4 | Dec., 1906 |
| Barney & Smith pr | 138 | −2 | | 2,500,000 | 8 cum | 8 Q. | Dec., 1906 |
| Bethlehem Steel | 20½ | +1½ | April 2 | 14 862,000 | | ..... | ..... |
| Bethlehem Steel pr | 65 | + 5 | | 14,908,000 | 7 n. c. | 3 Q. | Nov., 1906 |
| Cambria Steel | 47⅛ | +3½ | Mar. 19 | 45,000,000* | 8 | 3 Q. | Aug., 1906 |
| Cambria Iron | 48¾ | +1¾ | | 8,468,000* | 4 | 4 S. A. | Oct., 1906 |
| Chicago Pneumatic Tool | 50 | ..... | Feb. 18 | 6,145,800 | 4 | 4 Q. | Jan., 1907 |
| Colorado Fuel | 56 | + ⅜ | Oct. 21 | 30,132,000 | | ..... | Apr., 1902 |
| Crucible Steel | 115⅝ | − ⅜ | Oct. 16 | 24,578,400 | | ..... | ..... |
| Crucible Steel pr | 78 | −1 | | 24,436,500 | 7 cum | 6 | Dec., 1906 |
| Empire Steel | ? | ..... | Feb. 27 | 2,281,400 | | ..... | ..... |
| Empire Steel pr | 47 | ..... | | 2,500,000 | 6 cum | 3 S. A. | July, 1906 |
| Fay & Egan | 95 | ..... | Feb. 19 | 1,000,000 | 6 | 6 Q. | Nov., 1906 |
| Fay & Egan pr | 128½ | ..... | | 1,000,000 | 7 cum | 7 Q. | Nov., 1906 |
| General Electric | 156⅜ | −3¾ | May 14 | 54,356,000 | 8 | 8 Q. | Jan., 1907 |
| Harbison-Walker | 13¼ | ..... | Jan. 21 | 18,000,000 | 6 | ..... | ..... |
| Harbison-Walker pr | 79¾ | ..... | | 9,600,000 | 6 cum | 6 Q. | Jan., 1907 |
| International Pump | 40 | ..... | June 4 | 17,762,500 | | 2 | Apr., 1905 |
| International Pump pr | 80 | − ¾ | | 11,850,000 | 6 cum | 6 Q. | Nov, 1906 |
| Lackawanna Steel | 71 | ..... | Mar. 13 | 34,971,400 | | ..... | ..... |
| Lake Sup. Corp | 14 | ..... | Oct. 2 | 40,000,000 | | ..... | ..... |
| New York Air Brake | 138¾ | ..... | June 18 | 10,000,000 | 8 | 8 Q. | Jan., 1907 |
| Niles-Bement-Pond | 130 | ..... | Feb. 6 | 5,000,000 | 6 | 6 Q. | Sept, 1906 |
| Niles-Bement-Pond pr | 105 | ..... | | 2,000,000 | 6 cum | 6 Q. | Dec., 1906 |
| Otis Elevator Co | 50 | ..... | March 18 | 6,350,300 | | 2 A. | Apr., 1906 |
| Otis Elevator Co. pr | 94 | ..... | | 6,308,500 | 6 n. c. | 6 Q. | Jan., 1907 |
| Penn. Steel | 60 | ..... | May 13 | 10,750,000 | | ..... | ..... |
| Penn. Steel pr | 106 | +2 | | 16,500,000 | 7 n. c. | 7 S. A. | Nov., 1906 |
| Pittsburg Coal Co | 16¾ | + ⅛ | Feb. 11 | 29,045,400 | | ..... | ..... |
| Pittsburg Coal pr | 57⅛ | −3⅜ | | 30,217,700 | 7 | ..... | Apr., 1905 |
| Pressed Stl Car | 55⅛ | −2 | Feb. 20 | 12,500,000 | | 3 | Aug., 1904 |
| Pressed Stl. Car pr | 99½ | +1 | | 12,500,000 | 7 n. c. | 7 Q. | Nov., 1906 |
| Pullman | 178½ | −1½ | Oct. 17 | 100,000,000 | 8 | 8 Q. | Oct., 1906 |
| Railway Stl. Spring | 55¼ | + ¾ | Mar 7 | 13,500,000 | | 4 S. A. | Oct., 1906 |
| Railway Stl. Spring pr | 99 | + ½ | | 13,500,000 | 7 cum | 7 Q. | Dec. 1906 |
| Rep. Iron & Steel | 39⅝ | −1⅛ | Oct. 9 | 27,191,000 | | ..... | ..... |
| Rep. Iron & Steel pr | 90 | + ⅜ | | 20,416,900 | 7 cum | 7 Q. | Jan., 1907 |
| Sloss-Sheffield | 75 | −1¾ | Mar. 5 | 10,000,000 | 5 | 5 S. A. | Oct., 1906 |
| Sloss-Sheffield pr | 102 | ..... | | 6,700,000 | 7 n. c. | 7 Q. | Jan , 1907 |
| Tenn. Coal & Iron | 161½ | ..... | May | 22,353,600 | 4 | 4 Q. | Nov., 1906 |
| U. S. Pipe & Fdy | 48⅛ | − ¼ | June 26 | 12,500,000 | 4 | 4 Q. | Dec., 1906 |
| U. S. Pipe & Fdy. pr | 87⅛ | ..... | | 12,500,000 | 7 n. c. | 7 Q. | Dec., 1906 |
| U. S. Steel | 40¼ | − ⅛ | April 15 | 508,302,500 | 2 n. c. | ½ Q. | Oct., 1906 |
| U. S. Steel pr | 106⅝ | + ⅛ | | 360,281,100 | 7 cum | 7 Q. | Nov., 1906 |
| U. S. Steel 5's | 98⅝ | + ⅜ | | 463,798,000 | 5 | 5 A. | ..... |
| Va. Iron, Coal & Coke | 84½ | +1½ | Sept. 17 | 8,641,600 | | ..... | ..... |
| Westinghouse Elec | 150 | −4 | June 26 | 20,996,350* | 10 | 10 Q. | Jan., 1907 |
| West'ghouse Air Brake | 158 | +3½ | Oct. 1 | 11,000,000* | | 22½ Q. | Jan. 1907 |

Par value of shares, $100, except those starred, $50.

**Financial Notes:—**

The Buffalo & Susquehanna Iron Co., Buffalo, N. Y., is putting on the market a limited amount of 25-year five per cent debenture gold bonds. They are being offered at 96 and accrued interest.

The directors of the Bethlehem Steel Co. will meet in January to take action on the preferred dividend. No change in the rate of ¾ of 1 per cent is anticipated.

The directors of the Republic Iron & Steel Co. will meet in February to take action on dividends.

The Spencer Kellogg Co., Buffalo, N. Y., has given a mortgage to the Commonwealth Trust Co., also of Buffalo, for $2,500,000 for the security of bondholders.

Formal announcement has been made by Cyrus H. McCormick, president of the International Harvester Co., that the company has filed its amended charter in New Jersey. The capital stock of $120,000,000 has been divided into two classes, consisting of $60,000,000 7 per cent cumulative preferred and $60,000,000 common. Stockholders will receive one share of new preferred stock and one share of new common for every two shares of old stock.

Recent dividend declarations include the following: United States Cast Iron Pipe & Foundry Co., regular quarterly 1¾ per cent on the preferred stock and 1 per cent on the common stock, payable March 1; American Ship Building Co., regular quarterly 1¾ per cent on the preferred stock, payable Jan. 10; Wheeling Mold & Foundry Co., Wheeling, W. Va., quarterly dividend of 2 per cent and an extra dividend of 1 per cent, payable Feb. 1 to stock of record Jan. 15; Oneida Steel Pulley Co., a dividend of 5 per cent to all stockholders of record Jan. 1, 2½ per cent to be paid Jan. 15 and 2½ per cent Aug. 15.

# NEWS FROM MANY INDUSTRIES.

**New Buyers:—**

The Worcester Textile Machine Co., Worcester, Mass., has been organized with a capitalization of $15,000 by G. A. Judson and others.

The Electric Furnace Co., Portland, Me., has been incorporated with a capital stock of $500,000 by J. E. Manter, D. Fullerton and M. W. Baldwin.

The Rinck Machinery Co, Belleville, Ill., has been organized with a capitalization of $5,000 by E. A. Rinck, S. Grundlach and Edmund Burke.

The Johnson Concrete Machine Co., Sioux City, Ia., has been organized with a capitalization of $10,000 by L. S. Johnson and C. W. Johnson.

The Orr Foundry Co., Orrville, O., has been incorporated with a capital of $10,000 by George Wendling. C. O. Henderson, S. M. Brenneman, Chris Smith and B. G. Cope.

The Vending Machine Co., Akron, O., has been organized with a capitalization of $9,600 by R. E. Lewis, William A. Palmer, G. M. Anderson, Philip Schneider and Asa Keck.

The Miami Valley Machine Tool Co., Dayton, O., has been organized with a capitalization of $20,000 by S. D. Conover, W. D. Foster, Harry T. Chamberlain, L. R. Evinger and P. P. H. Conover.

The Sipp Railway Equipment Co., Chicago, Ill., has been organized with a capitalization of $5,000 by Benjamin Sipp, of 50 St. James place Chicago; I. Shrimski and James R. McClellan.

The Swedish Iron & Steel Corporation, New Orleans, La., has been organized with a capitalization of $10,000 by Frederick P. Morrell, Nils Herlitz and Lindsey A. Woodward.

The Bradford Draft Gear Co., Monadnock block, Chicago, has changed its name to the Bradford Car & Mfg. Co., and has increased its capital from $50,000 to $200,000.

The United Foundry & Machine Co., Canton, O., has been incorporated with a capital of $10,000 by George P. Bonsky, G. F. Ebel, August Reichert, Paul Bonsky and W. H. Smith.

The Winnipeg Foundry Co, Ltd., Winnipeg, Man., with $20,000 capital stock has been incorporated by Joseph T. Hill, Harvey Bell, Wesley A. Armstrong, Alex. D. Irish, Arthur J Brown and F. W. Trish.

The Green Engineering Co., Chicago, Ill., has increased its capital from $75,000 to $200,000 to cover the erection of its plant at East Chicago, Ind. The company manufactures chain grate stokers.

The Monroe Tool Works, Rochester, N. Y., has been incorporated to manufacture tools, machines, etc. The capital stock of the company is $12 000, and the incorporators are: B. D. Bogley, M. E. Bogley and H. D. Taylor, all of the address given above.

The Union Iron & Brass Works, El Paso, Tex., has been organized with a capitalization of $50,000 by W. J. Harris, A. Courchesne, J. H. Nations, J. G. House, T. G. Link, Felix Martinez, John M. Wyatt, S. W. Galbraith and J. P. Hallihan, all of El Paso.

The Rusk Iron Co. has been formed at Rusk, Tex., with W. H. Oatley as president and general manager; John S. Wightman, treasurer; Amos J. Mitchell, vice president, and V. W. Ricords, secretary and assistant general manager. Mr. Oatley has gone east to close contracts for coke and other supplies, while Mr. Ricords is now at Rusk, directing the work of repairs.

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**New Construction:—**

The Ravena Iron Co., of Ravena, N. Y., is building an addition to its molding room.

The Norwood Engineering Co., of Florence, Mass., is building an addition to its machine department.

The Norwalk Iron & Steel Co., Norwalk, O., is planning to install a new plant for the manufacture of crucible steel.

George W. Prentice & Co., manufacturers of machinery and tools, will enlarge their factory, at New Haven, Conn., by building an addition.

The Keystone Driller Co., of Pittsburg, has closed a deal for the purchase of 22 acres of ground at Beaver Falls, Pa., upon which it will erect a new plant.

The Tidewater Steel Co.'s new blast furnace, at Chester, Pa., is nearing completion. Engines are already in position. The Maryland Steel Co. is the lessee of the furnace.

The Wheeling Enameled Iron Co. has just completed a new store house 40 x 100 feet, at its plant near Wheeling, W. Va., and is contemplating the erection of several other new buildings.

The D. & W. Fuse Co., of Providence, R. I., has contracted for the equipment and construction of its new foundry building. It is stated that the foundry will be a modern plant in all particulars, fuel oil being used with Schwartz and Steele-Harvey furnaces.

Contracts have been awarded by the Coffeyville Machine Shop & Foundry Co., Coffeyville, Kas., for three buildings, one 60 x 100 feet, another 48 x 100 feet and a third 50 x 45 feet. The buildings are extensions to the foundry and machine shops of the present plant.

The American Skein & Foundry Co., of Racine, Wis., whose plant was damaged by fire Dec. 22, states that it is having plans made for a large new building to replace the damaged structure. The company has installed machinery in another building to replace that damaged by fire, and is now running the plant as usual.

The work of clearing away the debris from the site of the Detroit Register Co.'s plant at Milan, Mich., which was destroyed by fire Dec. 29, has been commenced preparatory to rebuilding the concern. The company is at present temporarily occupying the deserted factory of the Stimpson Standard Computing Scale Co. at Milan.

The contract has been let by Bridgman Bros. Co. for the erection of a new factory building at Fifteenth and Washington avenue, Philadelphia, which will be of brick and concrete, 90 x 100 feet, four stories. Considerable of the equipment has already been purchased, but the power plant has not yet been provided for, and it is undecided whether gas, steam or electricity will be used.

The Standard Nut & Bolt Co., of Valley Falls, R. I., will erect a one-story wood factory building 40 x 112 feet with a wing of 40 x 72 feet. The foundation will be of concrete, roof tar and gravel. Machinery for the manufacture of nuts and bolts will be required. Alexander Leslie, of Lincoln, R. I., is president, and Albert H. Humes, of Pawtucket, R. I., is treasurer of the company.

The Ralston Steel Car Co., of Columbus, O., states that the new addition which it contemplates erecting in the spring will be of steel corrugated roof and brick siding. No additional machinery will be required outside of paint spraying machines. The equipment is now being installed in a 300-foot extension recently made to the main building of the works.

Work on the reconstruction of the plant of the Michigan Stove Co., at Detroit, Mich., which was greatly damaged by fire Jan. 8, has been begun. George H. Barbour, first vice president and general manager of the company, states that the manufacture of stoves will be resumed at once. The two new buildings which were in the course of erection at the time of the fire will be rushed to completion to give the company space for manufacturing purposes.

**General Industrial Notes.—**

The new foundry of the Canadian Rand Drill Co., of Sherbrooke, Quebec, has been put in operation.

After a shutdown for several weeks, the Marshall Iron Works, of Newport, Del., has resumed operations.

The Great Falls Iron Works, of Great Falls, Mont., recently cast a 10-ton wheel which is said to have been the largest casting ever made in the state.

The Delaney Forge & Iron Co., Buffalo, N. Y., has made an offer to the city to buy the old Ohio basin which adjoins property owned by the concern.

The Flood City Foundry, a new industry of Johnstown, Pa., began operations Jan. 1. The owners of the plant are Earl C. Adams and Stephen George.

The Connellsville Mfg. & Mine Supply Co., Connellsville, Pa., has replaced with an all-steel structure the boiler house recently destroyed by fire. Operations were not interrupted.

**The Penn Iron Works, at Lancaster, Pa., has started up in all departments after three months' suspension. The puddle mill is now running at the general central Pennsylvania rate.**

The Standard Steel Car Co., of Pittsburg, is negotiating with the chamber of commerce of Youngstown, O., for the removal of its plant to the latter city. The Standard company is desirous of increasing its facilities.

The receiver of the Lafayette Stove Foundry, at Lafayette, Ind., has been granted permission by the court to operate the plant for the purpose of finishing some cast iron pipe and fittings and putting it in a marketable condition.

The Gale Mfg. Co., of Albion, Mich., has decided to contract with the Commonwealth Power Co. to furnish 300 horsepower of electric current for the next five years. Motors will replace the big Corliss engine formerly used by the plant.

James Love and Charles Seitz have purchased the Capitol Foundry at Lexington, Ky., and both have resigned their positions with the United States Cast Iron Pipe & Foundry Co., at Addyston, O., to take charge of their new business.

The Monessen Foundry & Machine Co., Monessen, Pa., has put into operation the new machinery and equipment recently installed, increasing the output of the plant 50 per cent and necessitating the employment of a large additional force of men.

The property of the Tufts Iron Works, of New Orleans, La., has been purchased by the Southern Marine Works and it will be transformed into an addition to the latter plant. This property adjoins that of the Southern Marine Works.

The output of the Nova Scotia Steel & Coal Co., Ltd., of New Glasgow, N. S., for 1906 was 688,085 tons, as compared with 558,036 tons in 1905. Improvements to the plant are expected to bring this production up to a million tons in 1907.

The Barlow Foundry Co. has succeeded to the business heretofore carried on by Arthur E. Barlow, at Newark, N. J. The plant has been conducted for the past eight years by various pioneers in the malleable and gray iron foundry industry.

Mussens Ltd., Montreal, Canada, a railway, mining and contractors supply firm, announces that it is merely the continuation of W. H. C. Mussen & Co., with headquarters and warehouse in Montreal and branch offices in Quebec, Toronto, Winnipeg and Vancouver.

At the Haselton plant of the Republic Iron & Steel Co., at Youngstown, O., on New Year's day, the new stack was blown in. Miss Olive Walker, of Youngstown, lighted the fire. The company now has in operation three modern furnaces in the Haselton group.

Negotiations are under way by the Standard Steel Tube Co. with the Marysville, O. board of trade, whereby the plant may be moved from Toledo, O., to the former city. F. W. Jewell, of Marysville, recently purchased an interest in the company and was elected its president and secretary.

V. R. and E. H. Browning, of the Browning Engineering Works, of Cleveland, took charge January 1 of the property of the Mansfield Engineering Co., of Mansfield, Ohio, which they recently purchased. They will conduct the concern as a separate organization along the same lines as the Browning Engineering Co.

Efforts are being made by John B. Newkirk and I. Roberts Newkirk, of John B. Newkirk & Co., Philadelphia, to reorganize the Diamond State Steel Co., of Wilmington, Del. They have announced that a new company has been formed to pay over the $575,000 bid at public auction for the plant by the Newkirk Co.

An engineering firm to be known as Myers & Whaley has recently been formed by Roy V. Myers, formerly chief engineer and superintendent of mines for the Dayton Coal & Iron Co., and William Whaley, mechanical engineer for the LaFollette Coal, Iron & Railway Co., LaFollette, Tenn. The officers of the new firm are in the Empire building, Knoxville, Tenn.

The Holland Launch & Engine Co., of Holland, Mich., has organized with the election of Jacob Lokker as president, Herman Garvelink as vice president and manager, Irving Garvelink as secretary and Dr. H. Bois as treasurer. The company has a capital stock of $15,000, and will manufacture launches and engines both for marine and general farm purposes.

Five blast furnaces of the Carrie group of the Carnegie Steel Co., at Rankin, near Pittsburg, produced 68,167 tons of iron during December, breaking the past records of the group. The best previous output was in March, 1905, when 66,520 tons were produced. Furnace No. 3 has a remarkable record, having been in constant operation for the past six years without a single day's interruption. Jacob Mohr, the present manager of the Carnegie plant, has made a record for the furnaces since he took charge a little more than a year and a half ago.

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**Fires:—**

The machine shop of the National Tube Works, West Philadelphia, Pa., was damaged by fire to the extent of $2,000, Jan. 3.

Fire at the millwright plant of Hagerty Bros., Peoria, Ill., Dec. 29, caused a damage of over $5,000, fully covered by insurance.

The H. W. Ollig Foundry & Machine Co., at Winthrop, Minn., was burned to the ground recently causing a loss of $10,000.

A fire in the copper shop of the Allentown, Pa. wire mill of the United States Steel Corporation, resulted in a loss of $2,000 recently.

A fire which started in the engine room practically destroyed the puddle mill and badly damaged the plate mill of the Potts Bros. Iron Co., at Pottsville, Pa., recently. The loss is $25,000, partly insured.

Fire in the building at 70-72 Washington street, Chicago, Ill., Jan. 6, caused a loss of $10,000. The building was occupied by the Eddy Bros. Machine Co., Western Pump & Machinery Co., National Interlocking Steel Sheeting Co. and W. G. Dawson, pattern machinery.

**Trade Notes:—**

The MacKinnon Boiler & Machine Co., Bay City, Mich., is adding a 48-inch shell cupola and increasing the height of the 16-inch shell cupola in its foundry.

The Empire Bridge Co., of Pittsburg, Pa., recently placed an order with the Cleveland Crane & Car Co., of Wickliffe, O., for the entire crane equipment for its Elmira, N. Y., plant.

Chas. H. Klie & Co., is the name of a new firm which is about to engage in the machine agency business in Columbus, O. Charles H. Klie, well known in iron manufacturing lines in Columbus, and his son will be associated in the business.

In one day's mail recently the Millett Core Oven Co., of Brightwood, Mass., received orders for five Millett patent core ovens from London, England; Paris, France; Buenos Ayres, Argentine Republic; San Francisco, Cal., and Portland, Ore.

The Canton-Hughes Pump Co., Canton, O., successor to the Canton Pump Co. and the Snider-Hughes Co., of Cleveland, has just completed the installation of machinery, received through the purchase of the Snider-Hughes Co., and also the erection of a two-story addition to its plant. The new organization starts the new year with a large volume of business in both domestic and export lines, and is now engaged in the erection of a number of large compound pumps for export to Japan, where the Canton Pump Co. had a large trade. The company also makes a specialty of pottery machinery.

## TRADE PUBLICATIONS.

**The Crown Drilling Machine Co.,** Akron, in catalog C describes a number of machines for well drilling, together with appliances for the same.

**The American Diamond Rock Drill Co.,** New York city, has issued catalog No. 26 entitled "The Diamond Drill and its Work." This describes a line of diamond drills for prospecting, testing foundations, bridges, buildings, etc., and presents a large number of illustrations of its use.

**The American Sheet & Tin Plate Co.,** Pittsburg, is distributing a book entitled "From Underfoot to Overhead," describing the manufacture of sheets and tin plates. This describes the process from its inception at the ore mines to the completed plate at the finished mill.

**The Abrasive Material Co.,** Philadelphia, has brought out its 1907 catalog. This describes abrasive wheels, including emery and corundum wheels of all shapes and sizes. The catalog comprises 68 six by nine pages, and illustrates a line of wheels for every conceivable operation of grinding.

**The New Process Raw Hide Co.,** Syracuse, has issued a catalog describing the new process raw hide noiseless gears and pinions. The catalog devotes considerable space to the process of the manufacture of the gears, and then presents tables of dimensions with a price list.

**The Newhall Chain Forge & Iron Co.,** New York, has issued catalog No. 101, describing hand forged crane, block and hoisting chains. It contains a number of illustrations of the various uses of the chain and also a table showing approximately, pitch, dimensions, weights, tests, breaking strains, etc.

**The E. H. Mumford Co.,** Philadelphia, has issued its catalog of molding machines. The machines illustrated are of the press, hand and jolt ramming types, the combined jolt and press ramming type and the multiple and the rock over machine. Sizes and capacities of machines are given, together with a disertation upon multiple molding.

**The A. S. Cameron Steam Pump Works,** New York, is distributing catalog No. 34, illustrating and describing a few designs of the Cameron steam pump. The steam and water ends of the pump are described in detail. The catalog then presents various types of pumps for different services, including boiler feed, condenser, mining, sinking, deep well, etc.

**The Ingersoll-Rand Co.,** Broadway, New York, in catalog 36 describes the Ingersoll-Sergeant air and gas compressors. It is a book of 184 six by nine pages, and gives a complete line of Ingersoll-Sergeant compressors built by the Ingersoll-Rand Co. A brief description of each of the nine classes is given, followed by tables of sizes and illustrations of typical machines and representative plants.

**The Geo. V. Cresson Co.,** Philadelphia, has just published catalog B, an unusually complete and handsome work. It is a six by nine book of 350 pages bound in cloth and printed in two colors, and lists a very complete line of power transmission machinery, including shafts, pulleys, rope drive sheaves, pillow blocks, hangers, couplings, etc. In addition to the material listed, including notes on shafting, notes on belting, dimensions of standard keys, notes on rope driving, notes on gearing, etc.

## HEAVIER DIVIDENDS WANTED.

At the annual meeting of the Warwick Iron & Steel Co., Pottstown, Pa., to be held in February, important developments are expected in the contest that is now being waged between certain stockholders and the management of the company. A committee of stockholders, headed by Charles K. Smith as chairman, in its letter to shareholders, requesting their proxies for the next election of the company, declares that the 4 per cent dividend last year is unsatisfactory. Stockholders say they are convinced that the management has been ultra-conservative. They declare the company has earned 15 to 20 per cent per annum, but has allowed no dividend for the past five years until the one in 1906. President Edgar S. Cook of the company has requested the shareholders to reserve action on the request of the committee of stockholders until the financial statement of the company has been issued to them.

In his statement issued prior to the formal financial report, President Cook states that during 1906 the sum of $431,060.84 was spent for necessary equipment and improvements. The production of the company has grown from 17,000 tons in 1878 to 220,000 tons in 1906. The net profits of 1906 are forecasted by President Cook to be $275,000.

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The Excelsior Steel Ball Co. has begun the construction of an addition to its plant, located a short distance north of Buffalo. The directors of the company propose to double the capacity.

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It is estimated in Chicago that probably $20,000,000, on the basis of plans calling for an ultimate expenditure of more than $100,000,000, will be spent in the Calumet industrial district in the coming building season. The companies which are to spend the greater part of this sum are the Indiana Steel Co., the Inland Steel Co. and the Standard Steel Car Co.

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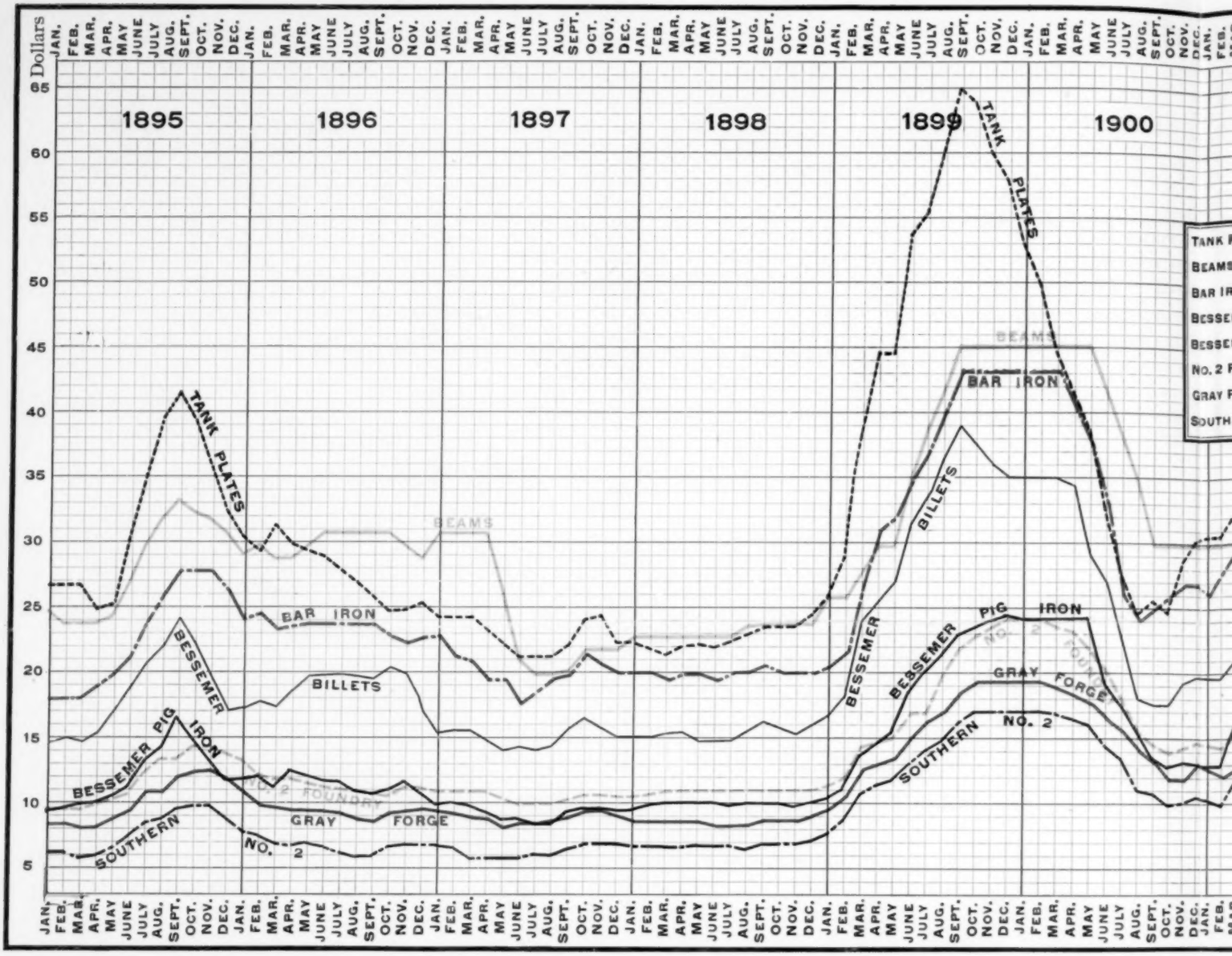
The Federal Furnace Co., which is expending several millions in the construction of blast furnaces at South Chicago, has made a bond issue of $1,000,000, bearing interest of five per cent. The bonds are divided into series A, $600,000, for refunding existing indebtedness, the series B, $400,000 which is reserved for improvements and extensions to be made from time to time. The bonds are secured by a mortgage on the plant of the Federal Furnace Co., in Chicago.

# THE IRON TR

## CHART SHOWING FLUCTUATIONS IN IRON A




## AVERAGE MONTHLY PRICES OF IRON

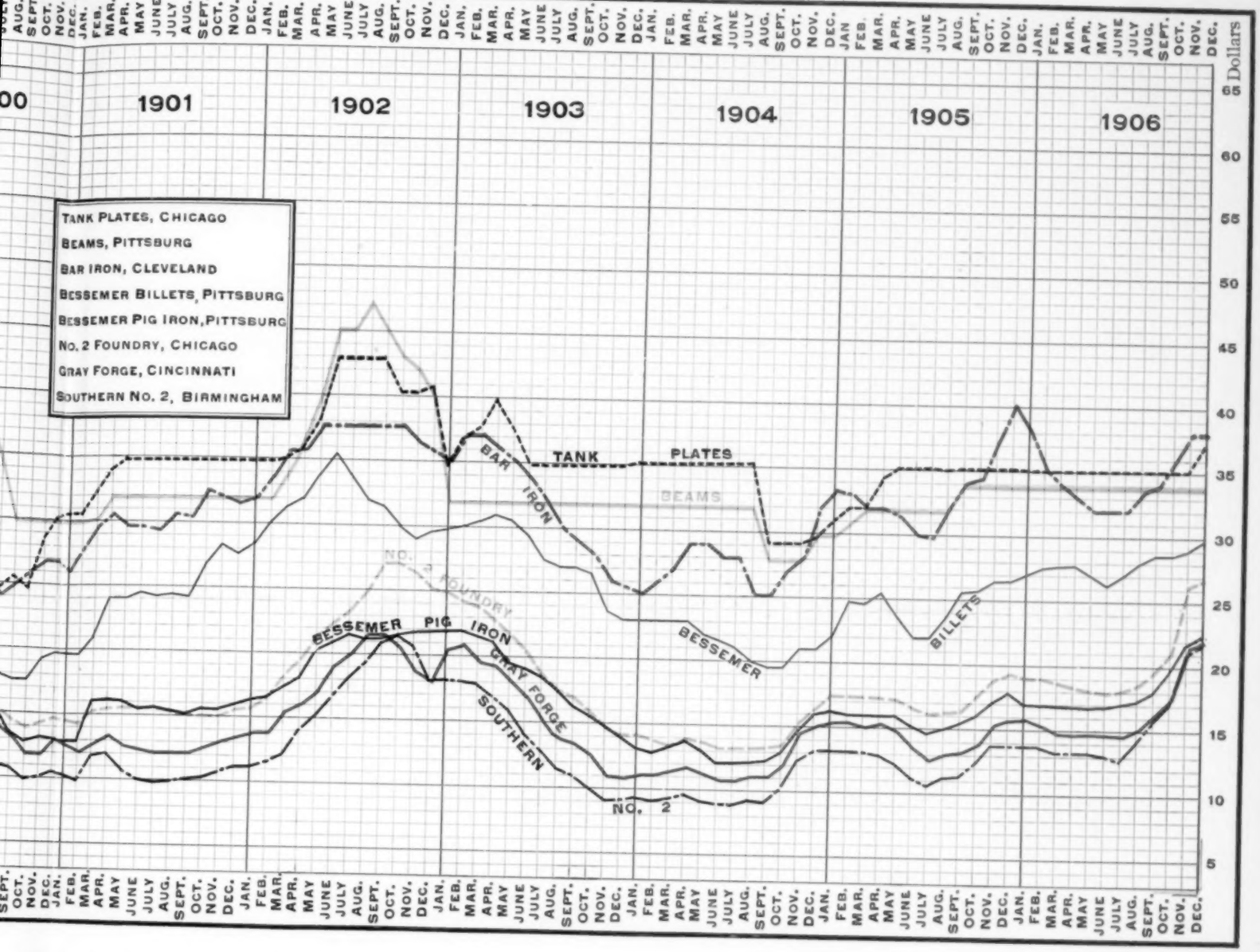
(FINISHED PRODUCTS IN NET TONS. BG IRO

| | 1897 | | | | | | | | | | | | 1898 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
| No 2 Foundry Chicago... | $11.00 | 10.75 | 10.75 | 10.75 | 10.25 | 10.00 | 10.00 | 10.00 | 10.25 | 10.75 | 10.75 | 10.50 | $10.50 | 10.50 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 |
| Gray Forge Cincinnati... | $ 9.35 | 9.05 | 9.00 | 8.75 | 8.00 | 8.25 | 8.25 | 8.50 | 8.90 | 9.10 | 9.25 | 9.25 | $ 8.75 | 8.75 | 8.75 | 8.75 | 8.75 | 8.60 | 8.50 | 8.50 | 8.75 | 8.75 | 8.75 | 8.90 |
| Plates Chicago..... | $25.00 | 25.00 | 25.00 | 24.25 | 23.00 | 22.00 | 22.00 | 22.00 | 22.75 | 24.25 | 25.00 | 23.00 | $23.00 | 22.50 | 22.00 | 22.75 | 23.00 | 22.75 | 23.00 | 23.50 | 24.00 | 24.00 | 24.00 | 25.00 |
| Billets (Bess.) Pittsburg.. | $15.25 | 15.50 | 15.50 | 14.75 | 14.00 | 14.25 | 14.00 | 14.15 | 15.75 | 16.50 | 15.75 | 15.00 | $15.00 | 15.00 | 15.25 | 15.25 | 14.85 | 14.75 | 14.75 | 15.45 | 16.10 | 15.75 | 15.25 | 16.00 |
| Bessemer Pig Pittsburg.. | $10.50 | 10.65 | 10.50 | 10.00 | 9.35 | 9.35 | 9.00 | 9.05 | 10.00 | 10.25 | 10.25 | 9.90 | $ 9.90 | 10.15 | 10.40 | 10 50 | 10.40 | 10.40 | 10.35 | 10.40 | 10.40 | 10.30 | 10 20 | 10.65 |
| Beams Pittsburg..... | $31.00 | 31.00 | 31.00 | 31.00 | 26.50 | 21.25 | 20.00 | 20.00 | 20 25 | 22.00 | 22.00 | 22.00 | $23.00 | 23.00 | 23.00 | 23.00 | 23 60 | 23.00 | 23.00 | 23.75 | 24 00 | 24.00 | 24.00 | 24.00 |
| Bar Iron Cleveland..... | $23.00 | 21.25 | 21.00 | 19.50 | 19.50 | 17.75 | 18.50 | 19.75 | 20.20 | 21.75 | 20.75 | 20.00 | $20.00 | 20.00 | 19.50 | 20.00 | 20.00 | 19.50 | 20.00 | 20.00 | 20.50 | 20.00 | 20.00 | 20.00 |

| | 1902 | | | | | | | | | | | | 1903 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
| No. 2 Foundry Chicago.. | $15.80 | 16.75 | 18.62 | 19.75 | 21.75 | 22.50 | 23.40 | 24.86 | 27.15 | 27.15 | 26.90 | 25.40 | $25.00 | 24.00 | 24.00 | 23.00 | 21.70 | 20.50 | 18.50 | 17.50 | 16.85 | 15.90 | 14.50 | 14.30 |
| Gray Forge Cincinnati... | $13.75 | 13.75 | 15.25 | 16.00 | 17.05 | 18.93 | 20.00 | 21.50 | 21.50 | 20.60 | 18.87 | 18.00 | $20.50 | 20.75 | 19.35 | 19.20 | 17.70 | 16.50 | 14.60 | 13.50 | 13.25 | 12.30 | 10.95 | 10.75 |
| Plates Chicago..... | $35.00 | 35.00 | 35.25 | 36.25 | 38.60 | 43.00 | 43.00 | 43.00 | 43.00 | 40.60 | 40.50 | 41.00 | $35.00 | 37.00 | 38.00 | 40.00 | 37.75 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 |
| Billets (Bess.) Pittsburg.. | $28.06 | 29.81 | 31.37 | 32.25 | 33.90 | 35.18 | 33.50 | 32.12 | 31.50 | 29.80 | 29.00 | 29.25 | $29.75 | 30.00 | 30.25 | 31.00 | 30.50 | 29.50 | 27.50 | 27.00 | 27.00 | 26.50 | 23.50 | 23.00 |
| Bessemer Pig Pittsburg.. | $16.70 | 16.93 | 17.56 | 18.37 | 20.95 | 21.25 | 22.00 | 21.75 | 21.75 | 21.95 | 22.25 | 22.12 | $22.35 | 22.35 | 22.00 | 21.60 | 20.00 | 19.85 | 19.00 | 17.85 | 16.35 | 15.85 | 15.25 | 14.35 |
| Beams Pittsburg..... | $32.00 | 32.00 | 34.00 | 37.00 | 40.00 | 45.00 | 45.00 | 47.00 | 45.00 | 43.00 | 42.00 | 40.00 | $32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 |
| Bar Iron Cleveland..... | $32.10 | 33.70 | 35.70 | 35.77 | 37.70 | 37.70 | 37.70 | 37.70 | 37.70 | 37.50 | 36.20 | 35.70 | $35.00 | 37.00 | 37.00 | 36.00 | 35.00 | 33.75 | 22.00 | 30.00 | 29.00 | 28.00 | 26.00 | 25.50 |

# TRADE REVIEW

## RON AND STEEL PRICES FOR TWELVE YEARS.




## IRON AND STEEL PRODUCTS, 1897-1906.

TONS. BG IRON AND BILLETS IN GROSS TONS.)

1899

| | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|
| | 14.25 | 15.00 | 15.25 | 17.00 | 17.00 | 20.00 | 22.00 | 23.00 | 23.50 | 24.50 |
| | 12.75 | 13.00 | 13.25 | 15.00 | 16.25 | 17.00 | 18.50 | 19.25 | 19.25 | 19.25 |
| | 39.00 | 43.00 | 45.00 | 53.50 | 55.50 | 60.50 | 65.00 | 64.00 | 60.00 | 58.00 |
| | 24.00 | 25.50 | 27.00 | 31.50 | 33.50 | 36.50 | 39.00 | 37.50 | 36.00 | 35.00 |
| | 14.00 | 15.15 | 16.25 | 19.00 | 20.75 | 22.00 | 23.50 | 24.00 | 24.50 | 25.00 |
| | 28.00 | 30.00 | 30.00 | 35.00 | 38.75 | 41.25 | 45.00 | 45.00 | 45.00 | 45.00 |
| | 27.50 | 31.00 | 32.00 | 34.75 | 36.75 | 39.75 | 43.00 | 43.00 | 43.00 | 43.00 |

1900

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $24.50 | 24.25 | 23.75 | 23.25 | 22.00 | 20.25 | 17.75 | 15.50 | 14.50 | 14.00 | 14.25 | 14.00 |
| $19.25 | 19.25 | 18.75 | 18.40 | 17.75 | 16.25 | 15.25 | 12.90 | 12.00 | 11.75 | 11.75 | 12.75 |
| $42.50 | 50.00 | 45.25 | 42.00 | 38.75 | 32.75 | 28.00 | 25.00 | 26.00 | 25.00 | 29.25 | 30.75 |
| $35.00 | 35.00 | 35.00 | 34.50 | 29.00 | 27.25 | 22.50 | 18.00 | 17.50 | 17.50 | 19.30 | 19.75 |
| $24.90 | 24.90 | 24.90 | 24.90 | 24.90 | 19.75 | 18.00 | 16.05 | 14.00 | 13.25 | 13.65 | 13.55 |
| $45.00 | 45.00 | 45.00 | 45.00 | 45.00 | 41.50 | 38.00 | 34.80 | 30.00 | 30.00 | 30.00 | 30.00 |
| $43.00 | 43.00 | 43.00 | 40.50 | 37.25 | 33.00 | 26.00 | 24.00 | 25.00 | 26.00 | 26.75 | 26.75 |

1901

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $14.60 | 14.12 | 15.19 | 15.50 | 15.50 | 15.50 | 15.50 | 15.20 | 15.00 | 15.00 | 15.00 | 15.50 |
| $12.55 | 11.87 | 12.56 | 13.12 | 12.60 | 12.25 | 12.00 | 12.00 | 12.00 | 12.25 | 12.69 | 13.00 |
| $31.00 | 30.00 | 32.40 | 34.40 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 |
| $19.75 | 19.75 | 20.81 | 24.12 | 24.20 | 24.44 | 24.25 | 24.40 | 24.12 | 26.80 | 28.25 | 27.62 |
| $13.25 | 13.60 | 16.56 | 16.69 | 16.65 | 15.94 | 16.00 | 15.90 | 15.71 | 15.90 | 16.10 | 16.35 |
| $30.00 | 30.00 | 30.40 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 |
| $25.80 | 27.80 | 29.30 | 30.80 | 29.80 | 29.80 | 29.40 | 30.80 | 30.60 | 32.80 | 32.00 | 31.70 |

1904

| | Mar. | Apr. | May | June | July | Aug. | Sept | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|
| | 13.55 | 14.00 | 13.80 | 13.40 | 13.30 | 13.35 | 13.40 | 13.70 | 15.60 | 16.60 |
| | 11.25 | 11.75 | 11.25 | 10.75 | 10.75 | 11.00 | 11.00 | 11.75 | 14.25 | 15.00 |
| | 23.00 | 25.00 | 22.00 | 21.50 | 21.00 | 20.00 | 19.50 | 19.50 | 21.00 | 21.00 |
| | 13.85 | 14.10 | 13.60 | 12.60 | 12.50 | 12.65 | 12.75 | 13.35 | 15.25 | 16.60 |
| | 32.00 | 33.00 | 32.00 | 32.00 | 32.00 | 32.00 | 28.00 | 28.00 | 28.00 | 30.00 |
| | 27.00 | 29.00 | 29.00 | 28.00 | 28.00 | 25.00 | 25.00 | 27.00 | 28.00 | 32.00 |

1905

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $17.50 | 17.50 | 17.50 | 17.50 | 17.25 | 16.00 | 16.15 | 16.35 | 16.50 | 17.55 | 18.90 | 19.50 |
| $15.25 | 15.20 | 15.00 | 15.20 | 14.81 | 13.35 | 12.28 | 13.00 | 13.00 | 13.88 | 15.35 | 15.75 |
| $31.30 | 32.30 | 32.30 | 32.30 | 34.80 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 |
| $21.00 | 24.90 | 24.60 | 25.50 | 28.50 | 22.00 | 22.00 | 23.50 | 25.77 | 25.95 | 26.30 | 26.50 |
| $16.85 | 16.45 | 16.35 | 16.30 | 16.20 | 15.65 | 15.00 | 15.40 | 15.90 | 16.50 | 17.70 | 18.10 |
| $30.00 | 31.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 32.00 | 34.00 | 34.00 | 34.00 | 34.00 |
| $33.25 | 33.00 | 32.00 | 32.00 | 31.50 | 30.00 | 29.75 | 32.00 | 34.00 | 34.25 | 37.20 | 40.00 |

1906

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $19.25 | 19.25 | 19.00 | 18.75 | 18.50 | 18.10 | 18.30 | 18.90 | 19.75 | 21.50 | 26.50 | 27.00 |
| $15.75 | 15.65 | 14.85 | 14.75 | 14.75 | 14.65 | 14.55 | 15.40 | 16.50 | 17.50 | 21.70 | 22.00 |
| $35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 35.30 | 37.30 |
| $27.00 | 27.50 | 27.65 | 27.75 | 27.00 | 26.25 | 27.00 | 28.00 | 28.50 | 28.50 | 29.00 | 29.75 |
| $17.32 | 17.29 | 17.26 | 17.25 | 17.24 | 17.38 | 17.57 | 17.96 | 18.44 | 20.06 | 21.96 | 22.75 |
| $34.00 | 34.00 | 34.00 | 34.00 | 34.00 | 34.00 | 34.00 | 34.00 | 34.00 | 34.00 | 34.00 | 34.00 |
| $38.00 | 35.50 | 34.00 | 33.00 | 32.00 | 32.00 | 32.00 | 33.50 | 34.00 | 36.00 | 39.00 | 39.00 |